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DEPARTMENT OF THE ARMY TECHNICAL MANUAL

264

ORGANIZATIONAL AND FIELD MAINTENANCE RADIO SET AN/GRR-7

HEADQUARTERS, DEPARTMENT OF THE ARMY

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Sig Sec, Gen Depots (10)
Sig Depots (17)
Army Pictorial Cen (2)
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Mid-Western Rgn Ofc (TASSA) (1)
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AFIP (1)
AMS (1)
Ports of Emb (OS) (2)
Trans Terminal Comd (2)
Army Terminals (2)
OS Sup Agcy (2)
Yuma Test Sta (2)
USA Elct PG (1)
Sig Lab (5)
Sig Fld Maint Shops (3)
Fld Comd, AFSWP (5)
Mil Dist (1)
Sector Comd, USA Corps (Res) (1)
USA Corps (Res) (1)
JBUSMC (2)
Units organized under following TOE's:
11-7 (2)
11-16 (2)
11-18 (2)
11-57 (2)
11-97 (2)
11-116 (2)
11-117 (2)
11-500 (AA-AE) (2)
11-557 (2)
11-587 (2)
11-592 (2)
11-597 (2)

NG: State AG (3); units—same as Active Army except allowance is one copy to each unit.
USAR: None.
For explanation of abbreviations used, see AR 320-50.

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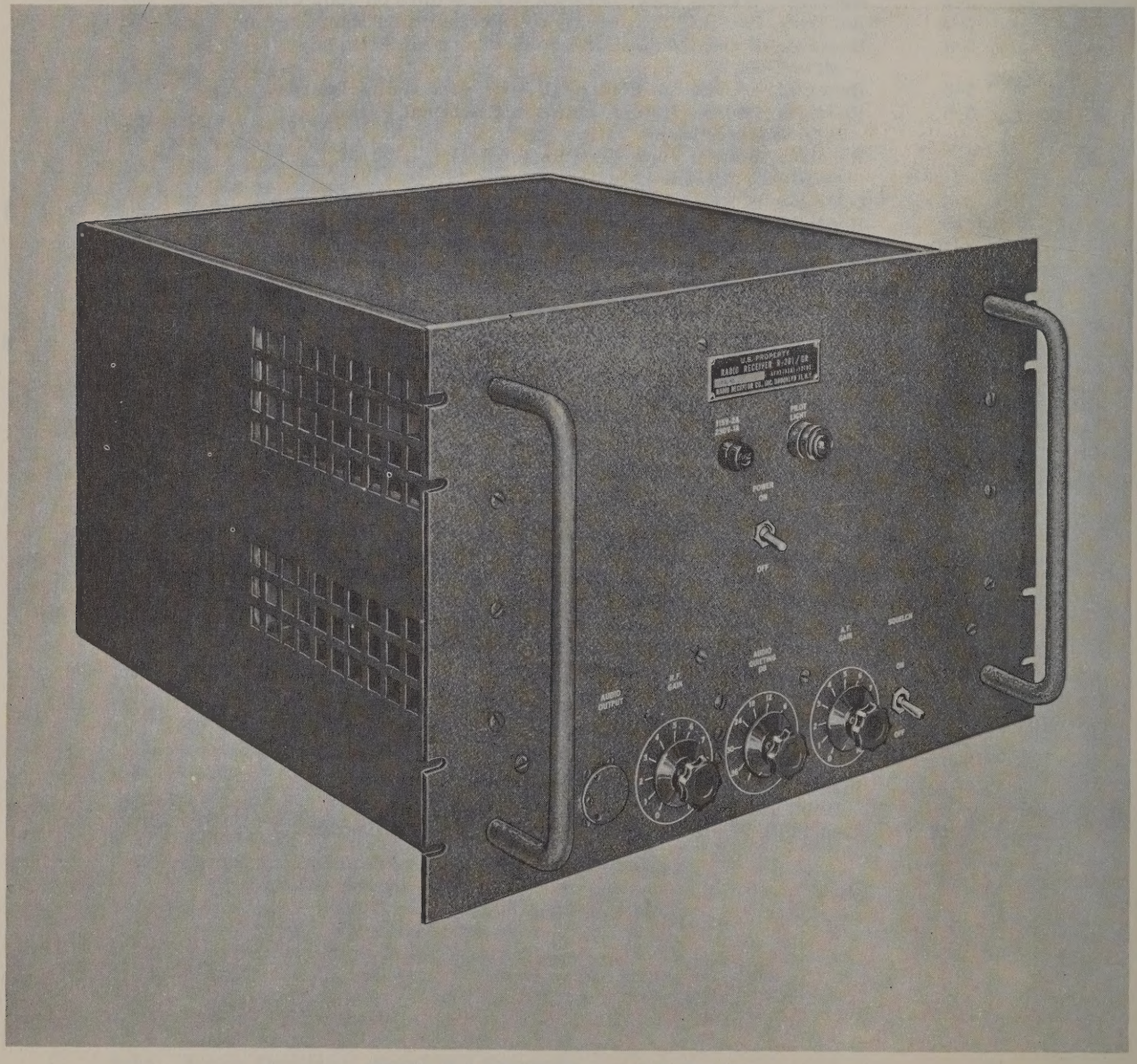


Figure 1-1. Radio Receiver R-361/GR

SECTION I

DESCRIPTION AND LEADING PARTICULARS

1-1. GENERAL.

1-2. The equipment described herein is designated as Radio Receiver R-361/GR, manufactured by Radio Receptor Company, Inc., Brooklyn, New York, and Antenna Assembly AT-197/GR manufactured by the J. & H. Smith Mfg. Co., Newburgh, New York, component parts of Radio Receiving Set AN/GRR-7. In addition to the information contained in this handbook, more data is available in the applicable Handbook of Operating Instructions, Overhaul Handbook, and Parts Catalog for this equipment.

1-3. PURPOSE. Radio Receiver R-361/GR is a single channel ground uhf (ultra-high-frequency) receiver, which covers the frequency range from 225 mc to 399.9 mc (megacycles). It is designed for single channel operation, and can be used for reception of either voice or tone amplitude modulated signals. Installation is intended in control towers and airways of US Air Forces.

1-4. LIMITATIONS. When used in conjunction with Modulator-Power Supply MD-141/GR and Transmitter T-282/GR, or an equivalent transmitting equipment, Radio Receiver R-361/GR is capable of establishing two-way radio communication with aircraft equipped with Radio Set AN/ARC-33, or other similar airborne radio sets. This receiver may also be used for two-way radio communication with other uhf ground communication radio sets.

1-5. BRIEF THEORY OF OPERATION. Radio Receiver R-361/GR is a double superheterodyne receiver utilizing two crystal controlled oscillators. There are two if (intermediate frequency) sections, the first of which is 40.4 mc and the second is 6 mc. In each case, the oscillator frequency is below the desired signal frequency. The receiver circuitry incorporates avc (automatic volume control) action, a series noise limiter and squelch circuits. It is capable of delivering one watt of audio power to a 600-ohm load.

1-6. FREQUENCY RANGE. The equipment will operate over a frequency range from 225 mc to 399.9 mc, inclusive.

1-7. TUNING. This set can be tuned to individual channels spaced 100 kc (kilocycles) apart in the uhf band, extending from 225 mc to 399.9 mc, inclusive. Tuning is accomplished by changing the first oscillator crystal and retuning the r-f (radio frequency) and oscillator sections. (See table 6-4.)

1-8. CRYSTALS. The first oscillator crystal is a CR-32/U type, operated in a thermostatically controlled crystal oven. The crystal frequency is determined as follows:

$$\text{Crystal frequency (mc)} = \frac{\text{channel frequency (mc)} - 40.4\ \text{(mc)}}{9}$$

The second oscillator crystal is a CR-23/U type operating at a fixed frequency of 34.4 mc.

1-9. INTERMEDIATE FREQUENCIES. The equipment utilizes two i-f frequencies. The first i-f frequency is 40.4 mc, the second i-f frequency is 6 mc.

1-10. ANTENNA INPUT. The antenna input circuit is unbalanced, one side being grounded. It is designed to work into a 52-ohm transmission line of the coaxial type.

1-11. AUDIO OUTPUT. Radio Receiver R-361/GR will produce at least one watt of audio power output across a 600-ohm balanced load when receiving a 50-uv (microvolt) signal modulated 30 percent on all frequencies between 400 and 3,000 cps. The output is terminated on a board at the rear of the receiver where terminals are provided for muting, monitoring and changeover from balanced to unbalanced output. In addition, an "AUDIO OUTPUT" jack is provided on the front panel for plugging in a 600-ohm headset.

1-12. SELECTIVITY. The selectivity of the receiver, with reference to 6 mc, is such that the bandwidth at -6 db (decibels) is greater than 85 kc and less than 225 kc at -60 db, except for sets having serial numbers of 800 or over, where the bandwidth at -6 db is greater than 60 kc and less than 175 kc at -60 db.

1-13. SENSITIVITY. A 3-uv signal modulated 30 percent with a 1,000 cps (cycles per second) audio tone, will produce at least 10 mw (milliwatts) of audio power, and a signal to noise ratio of at least 10 db.

1-14. VOLTAGE SUPPLY. This equipment will operate on either of the following a-c voltage supplies:
105 - 125 V, single phase, operating at 50-60 cps.
210 - 250 V, single phase, operating at 50-60 cps.

1-15. FILAMENT VOLTAGE. All tubes in this equipment are operated from secondary windings of the power transformer. A 5 V winding supplies the rectifier tube filaments while all other tubes are operated from a 6.3 V winding.

1-16. POWER REQUIREMENT. The average power consumption is 125 w and peak power is 140 w.

1-17. TEMPERATURE RANGE. Radio Receiver R-361/GR will operate satisfactorily on continuous duty at temperatures ranging from -29°C (-20°F) to +55°C (+131°F).

1-18. STABILITY. The overall frequency stability for the entire frequency range is ±10 kc.

1-19. WARM-UP PERIOD. The equipment will be ready for operation five minutes after it is turned on, and should be within 10 kc of the required frequency after 20 minutes.

1-20. CONTINUOUS OPERATION. The receiver can be operated continuously for 700 hours without impairing the functioning of the set.

1-21. TUBE COMPLEMENT. Table 1-1 lists all tubes used in Radio Receiver R-361/GR.

TABLE 1-1. TUBE COMPLEMENT

Quantity	JAN Type Number	Function	Quantity	JAN Type Number	Function
2	5Y3GT	Full wave rectifiers	1	6BA6	Second i-f amplifier
1	6AG5	First amplifier	1	6BA6	Third i-f amplifier
1	6AK5W	Second tripler	1	6BE6	Second mixer
1	6AK5W	Second amplifier	1	6J4	First r-f amplifier
1	6AK5W	Third r-f amplifier	1	6J4	Second r-f amplifier
1	6AK5W	First mixer	1	12AT7	First oscillator and first tripler
1	6AL5W	Second detector - noise limiter	1	12AT7	Second oscillator
1	6AL5W	AVC detector - squelch diode	1	12AX7	First audio amplifier - squelch quieting
1	6AQ5	Power output			
1	6AU6	AVC amplifier	1	12AX7	Second audio amplifier - squelch amplifier
1	6BA6	First i-f amplifier			

1-22. FUSE COMPLEMENT. The equipment is provided with one fuse located on the front panel. The rating of the fuse furnished depends on the power supply voltage used as indicated in Table 1-2.

TABLE 1-2. FUSE COMPLEMENT

Quantity	Type	Rating
1	AGC, glass cartridge	2 amp for 115 V input
1	AGC, glass cartridge	1 amp for 230 V input

1-23. OPERATING AND ADJUSTMENT CONTROLS. Table 1-3 lists the various control and adjustment points for this equipment as found on the front panel and the chassis. The controls are shown on figures 1-2 through 1-4.

TABLE 1-3. CONTROLS

Name	Location (Operator facing front panel)	Function
"POWER ON-OFF" switch (S301)	Front panel	Turns power on and off.
"SQUELCH ON-OFF" switch (S302)	Front panel	Turns squelch circuit on and off.
"R.F. GAIN" control (R309)	Front panel	Controls the signal level at which the squelch will open, when the "SQUELCH ON-OFF" switch is in the "ON" position.
"AUDIO QUIETING DB" control (R333)	Front panel	With the "SQUELCH ON-OFF" switch in the "ON" position, this control provides up to 30 db of audio quieting.
"A.F. GAIN" control (R327)	Front panel	Audio output control for the receiver.
"NOISE LIMITER SWITCH ON-OFF" (S303)	Top right front of chassis	Activates and deactivates the noise limiter.
"1st OSC" (C501)	Top center of chassis	Tuning control for oscillator section.

Continued on next page

TABLE 1-3. CONTROLS (Cont)

Name	Location (Operator facing front panel)	Function
"1st TRIPL PLATE" (C502)	Top left of chassis	Tuning control for oscillator section.
"1st AMPL PLATE" (C503)	Top rear of chassis	Tuning control for oscillator section.
"2nd TRIPL PLATE" (U501)	Top rear of chassis	Tuning control for oscillator section.
"2nd AMPL PLATE" (U502)	Top rear of chassis	Tuning control for oscillator section
"2nd OSC TUNING" (C528)	Top center of chassis	Tuning control for second oscillator in oscillator section.
"ANT." (U401)	Top left rear of chassis	Tuning control for r-f section.
"1st RF PLATE" (U402)	Top rear of chassis	Tuning control for r-f section.
"2nd RF PLATE" (U403)	Top rear of chassis	Tuning control for r-f section.
"3rd RF PLATE" (U404)	Top rear of chassis	Tuning control for r-f section.
Primary tuning adjustment for T301	Bottom left rear of chassis	40.4 mc i-f tuning.
Secondary tuning adjustment for T301	Top right rear of chassis	40.4 mc i-f tuning.
Tuning adjustment for L307	Bottom left rear of chassis	40.4 mc i-f tuning.
Primary tuning adjustment for T303	Bottom left center of chassis	6 mc i-f tuning.
Secondary tuning adjustment for T303	Top right center of chassis	6 mc i-f tuning.
Primary tuning adjustment for T304	Bottom left center of chassis	6 mc i-f tuning.
Secondary Tuning adjustment for T304	Top right center of chassis	6 mc i-f tuning.
Primary tuning adjustment for T305	Bottom left front of chassis	6 mc i-f tuning.
Secondary tuning adjustment for T305	Top right front of chassis	6 mc i-f tuning.
Primary tuning adjustment for T306	Bottom left front of chassis	6 mc i-f tuning.
Secondary tuning adjustment for T306	Top right front of chassis	6 mc second detector tuning.
AVC tuning adjustment for T302	Bottom front center of chassis	6 mc avc amplifier tuning.

1-24. ANTENNA ASSEMBLY AT-197/GR. Antenna Assembly AT-197/GR has a frequency range of 225 to 400 mc, a power rating of 1000 watts, 100% amplitude modulation, a radiation pattern which is circular within 1/2 db, a nominal impedance of 52 ohms, and a maximum standing wave ratio of 1.6 to 1. Polarization is vertical (E plane). The assembly weighs 6 pounds net and measures 19 inches (maximum diameter) by 27 inches (length).

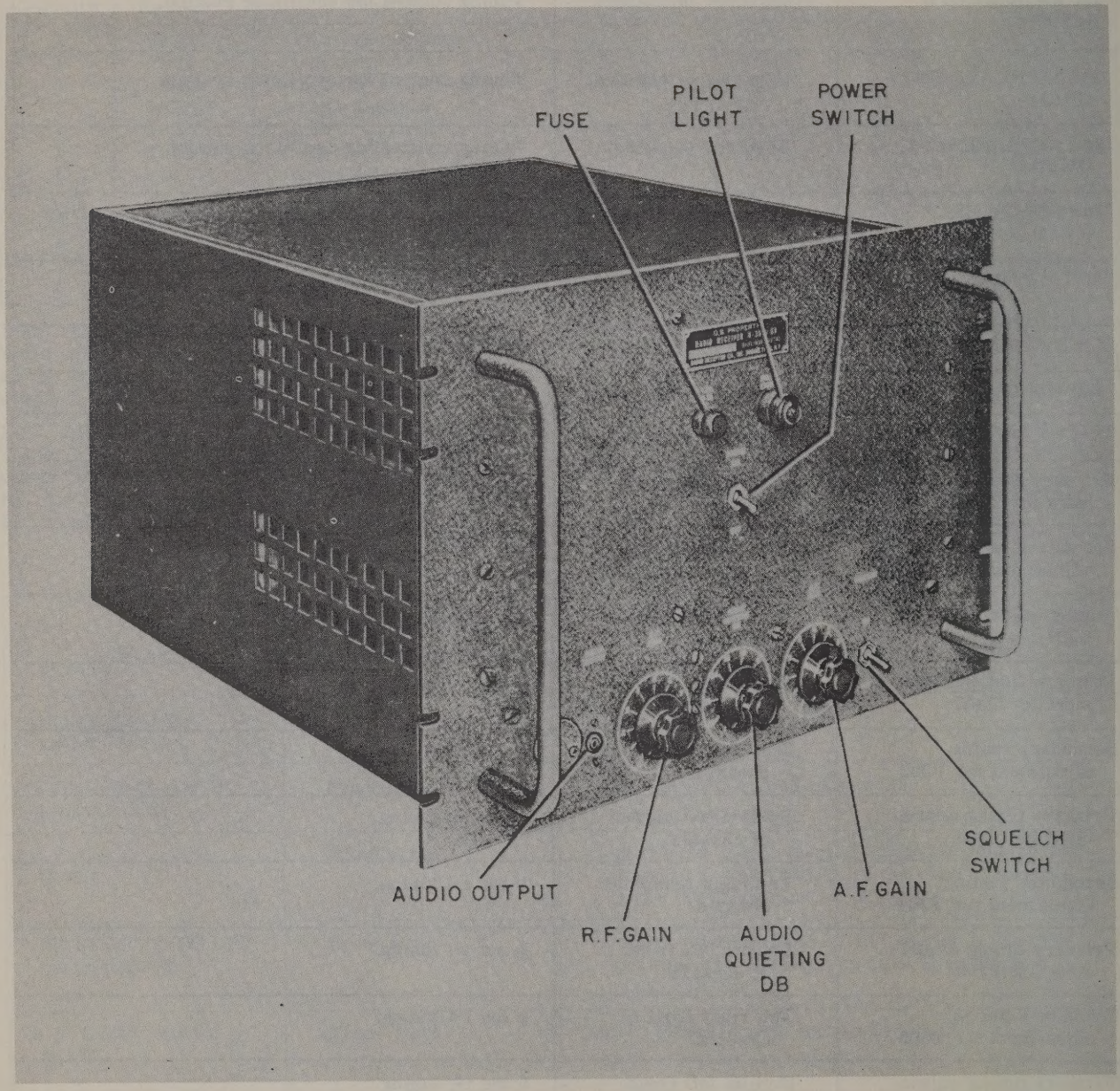


Figure 1-2. Radio Receiver R-361/GR, Front View

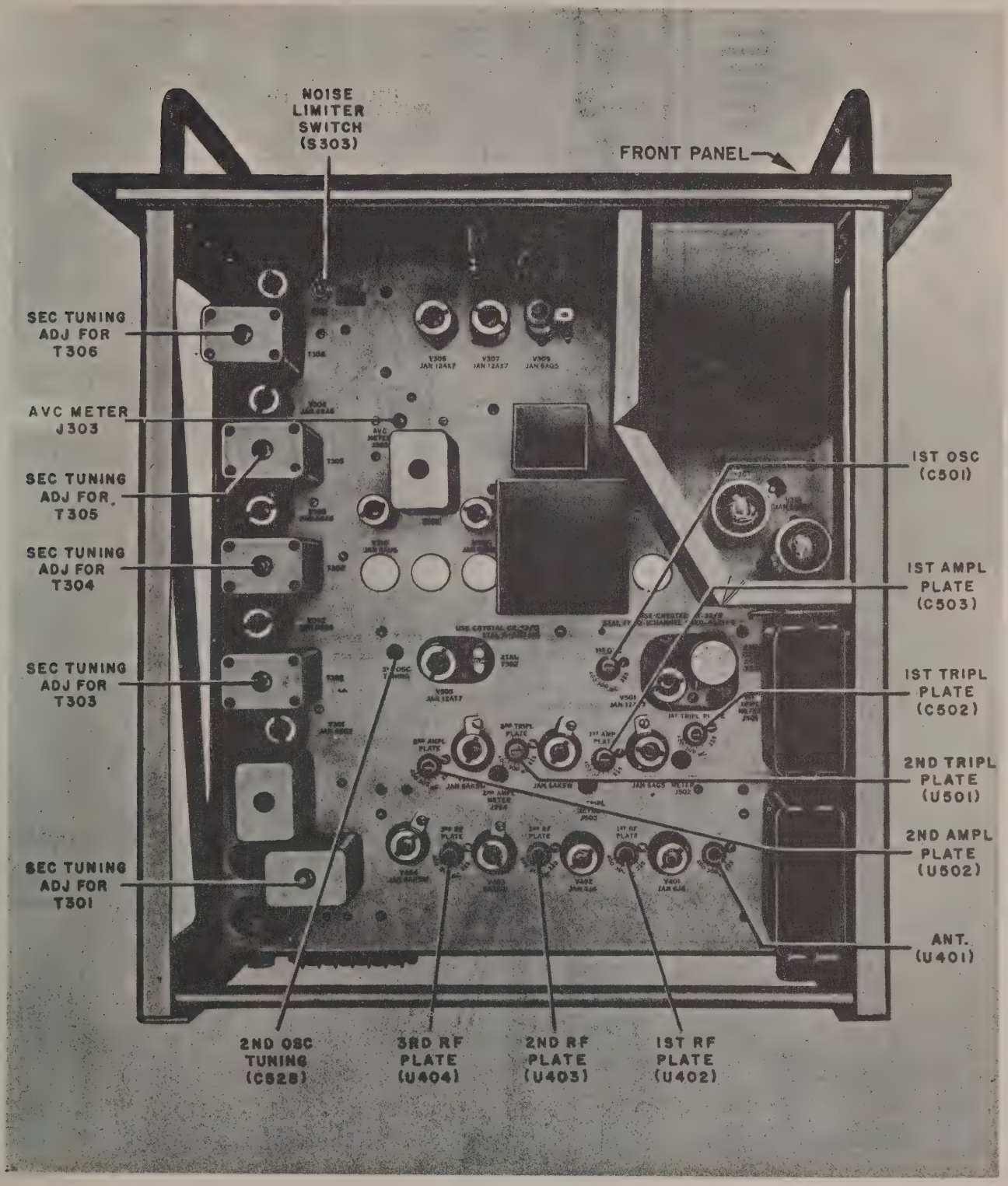


Figure 1-3. Radio Receiver R-361/GR, Top View, Dust Cover Removed

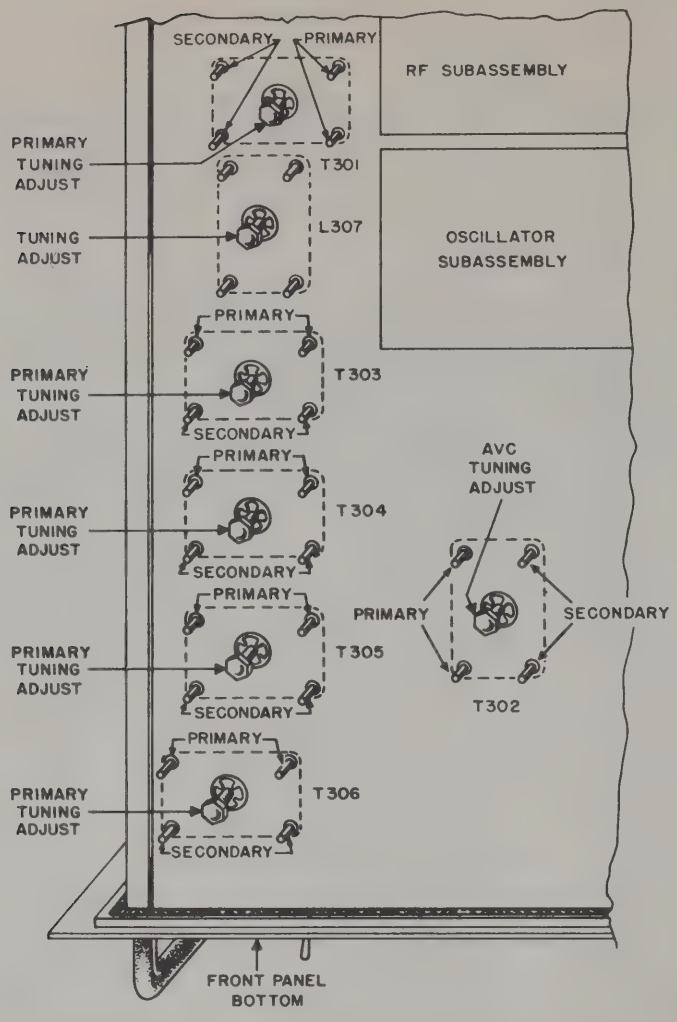


Figure 1-4. Radio Receiver R-361/GR, Bottom View, Dust Cover Removed

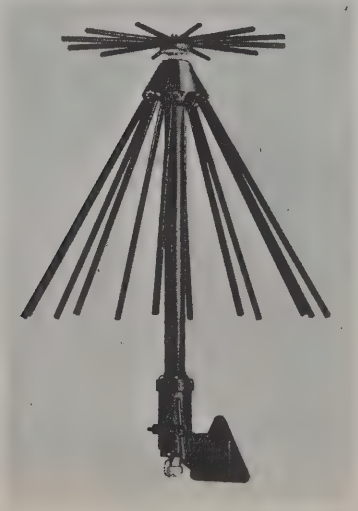


Figure 1-5. Antenna Assembly AT-197/GR

SECTION II

TEST EQUIPMENT AND SPECIAL TOOLS

2-1. SPECIAL TOOLS.

2-2. No special tools are required for the maintenance of this equipment.

2-3. CABLE FABRICATION.

2-4. No specially fabricated cables are required for bench test set-ups.

2-5. TEST EQUIPMENT.

2-6. Table 2-1 lists the test equipment required for trouble shooting, preventive maintenance, and adjustments.

TABLE 2-1. TEST EQUIPMENT REQUIRED FOR MAINTENANCE

Fig No.	Name	Mfr. Designation	Alternate	Application
5-9, 6-1	Signal Generator	Measurements Corp. No. 65B	Measurements Corp. No. 80	6 mc tuning
5-1, 5-9	Signal Generator	Hewlett-Packard Model 608A	Measurements Corp. No.80 (do not use for signal to noise ratio measurements as instrument has excessive fm)	40.4 mc tuning and r-f tuning 225-399.9 mc
5-9, 5-10	Audio Oscillator	Hewlett-Packard Model 200	Sylvania No. 145	Check audio circuit
5-9, 6-3	A-C Voltmeter	General Electric No. AP-9	Weston Model 433	Measure line voltage input
6-3	Wattmeter	General Electric No. AP-9	Weston Model 432	Measure power input
5-9, 6-3	Variac	General Radio No. V-5HMT	Superior Elec. Powerstat Type 216U	Vary input voltage
5-9	Cathode Ray Oscilloscope	Dumont No. 304	Dumont No. 208	Check noise limiter
5-9	Tube Tester	Hickock Model 536	Sylvania Type 220	Check tubes
5-1, 5-9 and 5-10	Multimeter	Triplett Model 630-A	Simpson Model 360	Output indication, voltage, and resistance measurements
5-9, 5-10	Vacuum Tube Voltmeter	Hewlett-Packard Model 410B	General Radio Type 1800-A	Measure a-c, d-c, and r-f voltages
5-9	Distortion Analyzer	Hewlett-Packard Model 330B	General Radio Type 736-A	Measure audio distortion
5-9, 6-1 and 6-2	Frequency Meter	BC 221		Calibrate signal generator

SECTION III

PREPARATION FOR USE AND RESHIPMENT

3-1. SELECTING AN OPERATING SITE.

3-2. Communication with the receiver is accomplished in the 225 mc to 400 mc band. Radio waves at these frequencies tend to travel in straight lines. For this reason, line-of-sight transmission paths are of major importance, as signal strength attenuates rapidly over paths which have obstructions between the receiver and the transmitter. Although the radio waves bend slightly around these obstructions reliable communication occurs only when line-of-sight paths exist. Line-of-sight transmission is attained when the receiving antenna is theoretically within optical range of the transmitter antenna. The most important factors limiting line-of-sight transmission are the curvature of the earth and intervening hills.

3-3. CURVATURE OF THE EARTH. The curvature of the earth limits the distance over which line-of-sight occurs. For example, with both the receiving and transmitting antenna located 40 feet above sea level, the maximum distance that can be spanned before the line-of-sight is obstructed by the curvature of the earth is approximately 18 miles. This is based on the assumption that the altitude of the intervening terrain is also at sea level. In order to obtain a line-of-sight path 50 miles long, the height of both antennas must be at least 315 feet above sea level and the altitude of the intervening terrain must be at sea level. To determine the maximum distance between two radio stations with the intervening terrain at sea level, the following formula is used:

$$D = \sqrt{2A} + \sqrt{2B}$$

where D = distance in miles
A = height in feet of one antenna
B = height in feet of the other antenna

3-4. INTERVENING OBSTRUCTIONS. Intervening hills, buildings and densely wooded areas in a transmission path reduce signal strength when they obstruct the line-of-sight. Radio waves bend over these obstructions slightly, but bending is accomplished by a loss in signal strength; the greater the bending, the greater the loss. Certain combinations of communication sites and intervening hills may provide satisfactory signals due to reflections, but this condition is realized only by chance, or by complex calculation with detail terrain maps. It can be predicted reliably that satisfactory communication will be obtained if line-of-sight transmission prevails. If line-of-sight does not exist, the path must be tested first to determine if the site is suitable. Weak or otherwise undesirable signals may be expected if the equipment is operated close to steel bridges, power lines or power units. If possible, choose a location on a hilltop or elevation. Flat ground is desirable. Normally, reception over water is better than over land.

3-5. HOUSING.

3-6. The best location for radio equipment depends on the tactical situation and local conditions such as the need to house the equipment where its shelter cannot be seen, the type of housing available and the terrain. The shelter for the receiver must meet the following requirements:

a. The floor must be capable of sustaining the weight of the equipment in a level position without vibration and with adequate drainage.

b. Sufficient space must be available in front of the mounting rack to install and remove the components.

c. Sufficient space must be available in back of the mounting rack to permit access to interconnecting cords and cables. Sufficient space must be left to provide a passageway to the rear of the equipment.

d. Except for the above limitations, the equipment may be located anywhere convenient to the transmission lines and external connections.

e. Adequate natural and/or artificial light should be provided so that all panel designations are legible and controls visible.

3-7. UNCRATING. (See figure 3-1.)

3-8. When equipment is received, select a location where it may be unpacked without exposure to the elements and which is convenient to the permanent or semi-permanent installation of the equipment.

CAUTION

Be careful in uncrating, unpacking, and handling the equipment; it is easily damaged. If it becomes damaged or exposed, a complete overhaul might be required or the equipment might be rendered useless.

3-9. Instructions for uncrating and unpacking the receiver are as follows:

a. Place the packing case as near the operating position as convenient.

b. Cut and fold back the steel straps.

c. Remove the nails with a nail puller. Remove the top and one side of the packing case. Do not attempt to pry off the sides and top; the equipment may be damaged.

d. Remove any excelsior or corrugated paper covering the inner corrugated fiberboard carton.

e. Carefully remove the receiver from its carton and place it on the workbench or near its final location.

f. Inspect the equipment for possible damage incurred during shipment.

g. Check the contents of the packing case against the master packing slip.

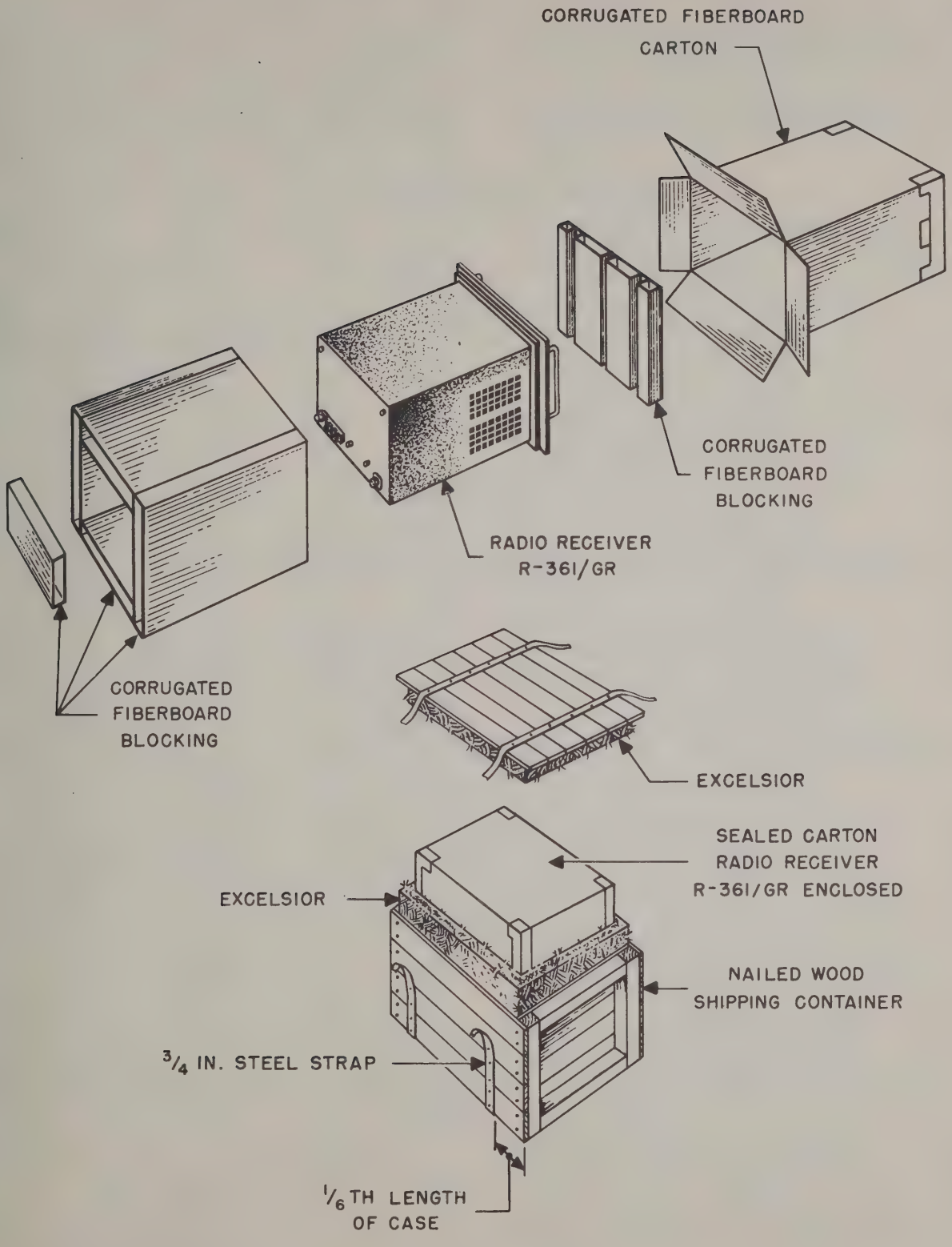


Figure 3-1. Radio Receiver R-361/GR, Packing Diagram

NOTE

Save the original packing case and containers. They can be used again when the equipment is repacked for storage or shipment.

3-10. EQUIPMENT REQUIRED FOR INSTALLATION.

3-11. The receiver may be used by itself or in conjunction with Radio Transmitter Set AN/GRT-3, which consists of Radio Transmitter T-282/GR, Modulator-Power Supply MD-141/GR and associated equipment. Seee Table 3-1 for equipment which is supplied. Table 3-2 lists the equipment required other than cables, but not furnished, for independent and systems use of the receiver. Refer to Tables 3-4 and 3-5 for the cables required to complete installation of the equipment.

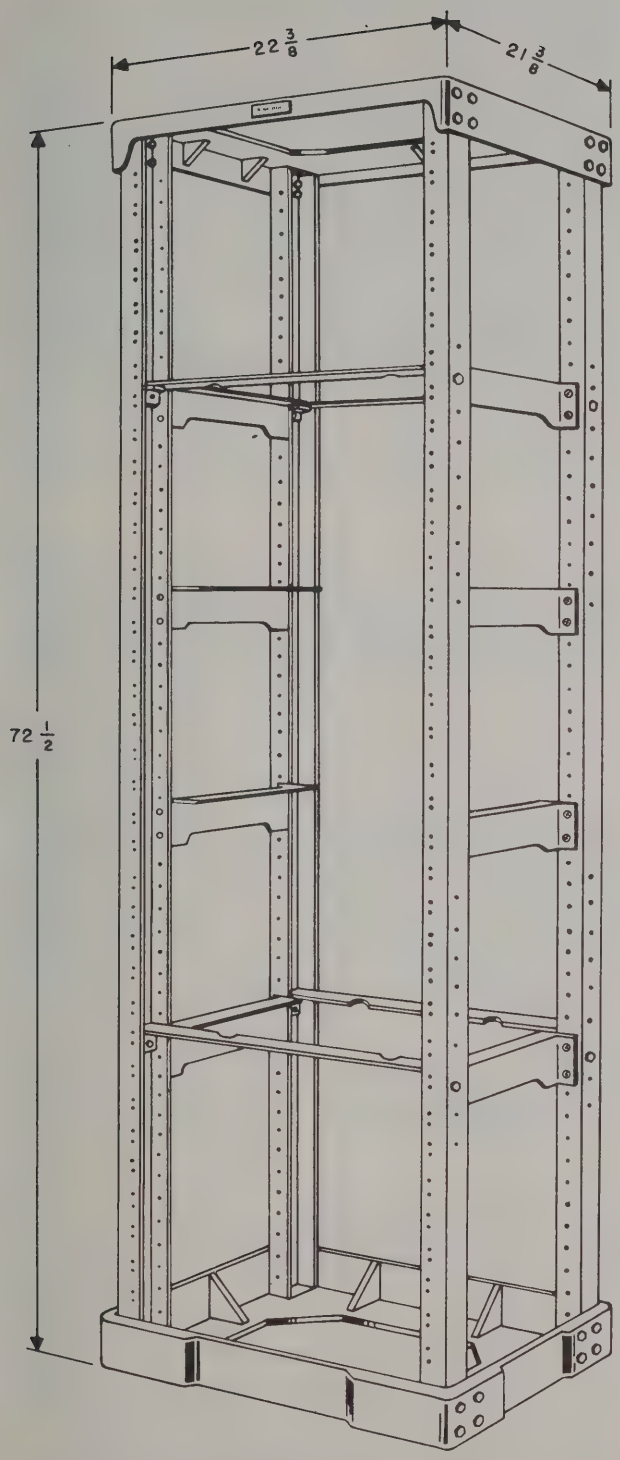
TABLE 3-1. EQUIPMENT SUPPLIED

Quantity	Name of Unit	Govt Type Designation	Description
1	Radio Receiver	R-361/GR	Complete with tubes and one crystal for second oscillator.
1	Socket screw key*		No. 6 multiple-spline
1	Socket screw key**		No. 10 multiple-spline
1	Resistor	RC20BF681K	680 ohms ±10%, 1/2 w.

*For location see figure 6-4. This is used to adjust the knobs on the r-f and oscillator chassis.
**For location see figure 6-4. This is used to adjust the knobs on the front panel.

TABLE 3-2. EQUIPMENT REQUIRED (BESIDES CABLES) BUT NOT SUPPLIED

Quantity	Name of Unit	Govt Type Designation	Description
1	Radio Transmitter	T-282/GR	Optional for radio transmission
1	Modulator-Power Supply	MD-141/GR	Furnishes a-c, a-f, and d-c voltages for T-282/GR
1	Rack	MT-686/GR	Equipment mounting
1	Distribution Panel	J-390/GR	For power and audio distribution
1	Mast	AB-158/GR	Antenna support
1	Antenna	AT-197/GR or AS-505/GR	For receiver or transmitter
1	Headset	CW-49507	600 ohms, complete with PL-55 plug.
1	Set of Crystals	CR-32/U	For first oscillator section. Frequency range: 20.511111 mc to 39.955556 mc.



ALL DIMENSIONS IN INCHES.

Figure 3-2. Rack MT-686/GR

3-12. RACK AND DISTRIBUTION PANEL.

3-13. Rack MT-686/GR is intended to house Radio Receiver R-361/GR. Four such receivers may be mounted in one rack. If desirable, two receivers, one Radio Transmitter T-282/GR, and one Modulator-Power Supply MD-141/GR may be placed in one rack. Distribution Panel J-390/GR furnishes a junction from which primary power can be distributed and from which audio and control connections to external units can be made.

3-14. RACK MT-686/GR. (See figures 3-2 and 3-3.) Rack MT-686/GR is shipped disassembled and must be assembled by the maintenance personnel. The following tools are necessary for assembly of the rack:

One Number 3 Phillips screwdriver.
One 7/16 in. open end wrench.
One 9/16 in. open end wrench.
One 5/8 in. open end wrench.

TABLE 3-3. LIST OF PARTS FOR RACK MT-686/GR

Item	Quantity	Name
A	1	Base
B	1	Top
C	2	Front channel
D	2	Rear channel
E	8	Chassis support
F	4	Tie bars
G	40	3/8 in. split lock washer
H	96	5/8 in. Phillips head machine screws
J	64	No. 12 flat washer
R	32	No. 12 split lock washer
S	40	3/8-24 hex nut
T	40	1-1/4 in. 3/8-24 hex head cap screw
U	8	Support block
V	1	Soldering lug
W	1	Split lock washer, 1/4 in.
X	1	1/4-20 hex nut
Y	1	3/4 in. 1/4-20 Phillips head brass machine screw

All of the major structural parts are stamped with item numbers. The front channels are symmetrically punched and may be used in either the right hand or left hand front positions. The rear channels are symmetrically punched also and may be used in either the right hand or left hand rear positions. All chassis supports (Item E) are symmetrically punched and may be used on either the right or left sides. The four vertical members are most easily assembled to the top and bottom with the rack channels in a horizontal position. Assemble the rack as follows:

a. Place the top (Item B) and bottom (Item A) pieces on the floor so that by tipping each up, the rack would appear to be laying on its back. The front edge of Item B is the edge with the name plate while the front edge of Item A is the edge adjacent to the Item A number.

b. Tip the bottom up and slide a front channel (Item C) into the corner cut-out. The front channel is the

edge with the series of holes placed in groups of two along the entire length.

c. Insert four of the 1-1/4 inch bolts (Item T) through the holes at the sides of the bottom member (Item A) and through the mating channel holes, then place lock washers (Item G) and nuts (Item S) (with flat sides towards lock washers) on them. Turn nuts to within two turns of being tight.

d. Slide the other front channel (Item C) into the other front corner cut-out and repeat step c.

e. Tip the top member (Item B) up and insert the two front channels into the corner cut-outs, then bolt, as in step c, for both channels.

f. Slide a rear channel (Item D) into both a top corner cut-out and its mating bottom cut-out. The tapped surfaces of the rear channels should be towards the front of the rack.

g. Repeat step c, then bolt the channel to the top in similar fashion.

h. Repeat steps f and g for the other rear channel.

i. Set the rack up and make a temporary panel layout on the front surface of the rack by very accurately scribing a mark on the front channels midway between the two panel holes (1/2 inch separation) where the panels of two units meet. Make proper allowances for blank panels.

j. Carefully bolt all four pairs of chassis supports (Item E) at the front channel so that the upper or supporting surfaces of the chassis supports are directly opposite the scribe marks. Loosely bolt the rear of the chassis supports to the rear channels. Use 5/8 inch long No. 12 bolts (Item H) and lockwashers (Items R) with Item R under the head of Item H.

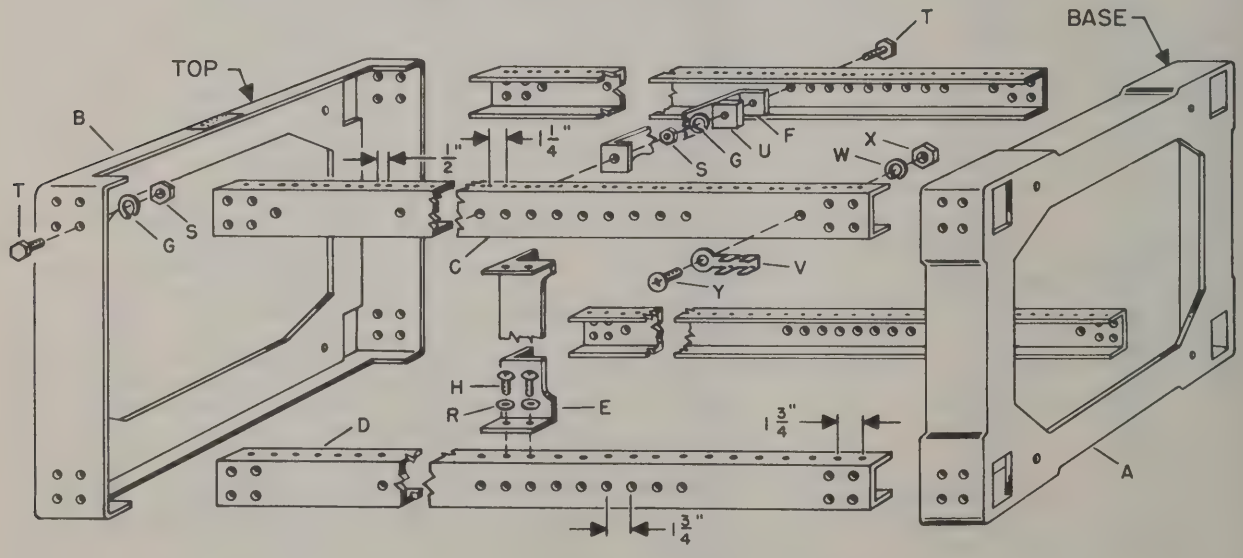
k. Bolt two tie bars (Item F) across the front of the rack and two across the back of the rack with the two notches toward the inside of the rack. Place them directly in front of and in back of the chassis supports (Item E) and at the same level as Item E so that they cause no interference with insertion of the units. These tiebars should be as nearly equispace from the top to the bottom of the rack as the layout will permit. The tie bars are bolted in place with 1-1/4 inch cap screws (Item T), lock washers (Item G), and hex nuts (Item S) with support blocks (Item U) between the lock washers and the tie bar.

NOTE

The support blocks have one corner rounded. Place this corner in the inside corner of the angles of the tie bar ends.

1. Tighten all screws, starting with those on the rear ends of the chassis supports (Item E) and then progressing to the tie bars (Item F), to the bottom (Item A) and to the top (Item B).

3-15. DISTRIBUTION PANEL J-390/GR. Distribution Panel J-390/GR occupies a space five and one-fourth inches high by nineteen inches wide by five and one-fourth inches deep. It is intended for panel mounting in Rack MT-686/GR. (See figure 3-4.) The three



NOTES:
1 - RACK IS ASSEMBLED ON ITS SIDE AS SHOWN.
2 - NOTCH IN REAR OF TIE BARS MUST FACE FORWARD.
3 - GROUNDING LUG ITEM V, SHOULD BE PLACED UNDER ITEM Y, IN BOTTOM OF EITHER FRONT CHANNEL.

Figure 3-3. Rack MT-686/GR, Assembly

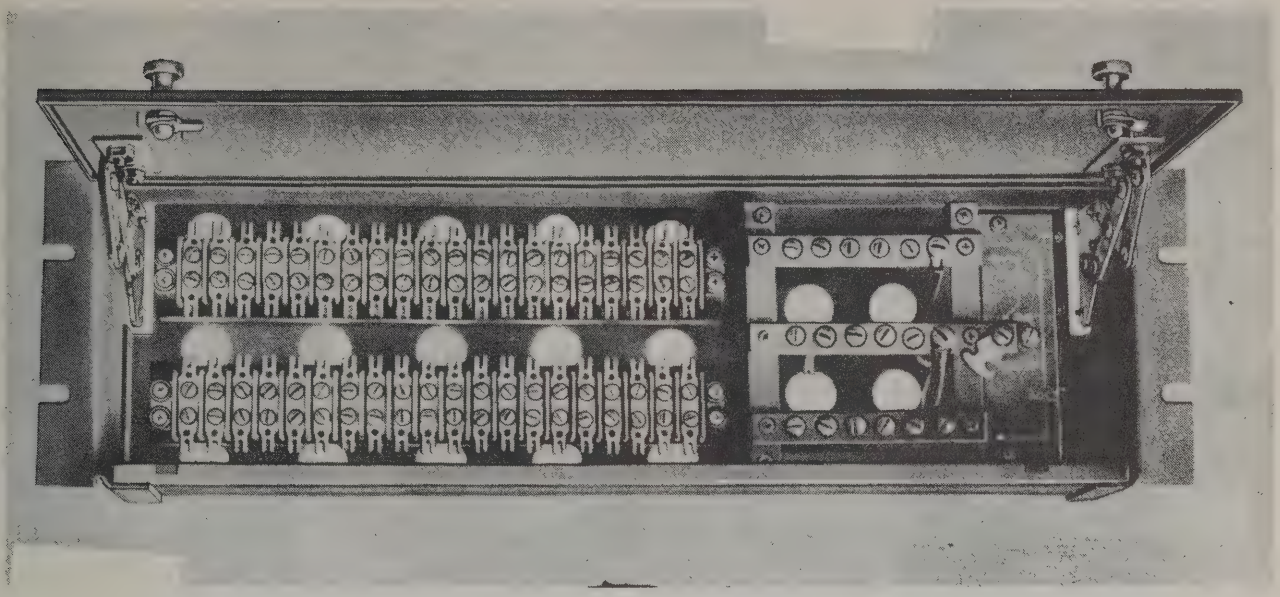


Figure 3-4. Distribution Panel J-390/GR

horizontal metallic bars are for primary power distribution. The center and bottom bars are for 115-volt operation; the top and bottom bars are for 230-volt operation. If, in 230-volt operation, a grounded neutral is used, the center bar is grounded by means of the notched switch blade attached to the end of the center bar. Two receptacles mounted on the back of the panel are available for convenience outlets. One wire from these outlets is permanently connected to the bottom bar. The other wire should be changed from the center bar to the top bar when changing to 230-volt operation. The voltage indication plate on the back of the panel is engraved 115 V on one side and 230 V on the other and should be turned to indicate the voltage being used. Forty terminals are available on two terminal strips for connecting control and audio services. Connect the external earth ground to the stud located between the two convenience outlets on the rear of the panel.

3-16. INSTALLATION OF RECEIVER.

3-17. After removal of Radio Receiver R-361/GR from its packing case, as per paragraphs 3-7 and 3-8, proceed as follows:

3-18. POWER INPUT CONNECTIONS. Measure the voltage of the 50-60 cps power line. The voltage required for operation of this equipment is 105 to 125 or 210 to 250 volts. Examine the reversible designation plate on the rear of the dust cover (see figure 3-5) which indicates the line voltage for which the primary of the power transformer T307 has been wired. If the voltage so designated does not agree with the power line voltage, proceed as follows:

a. Stand the receiver on its front panel handles.

b. Loosen the four captive screws that hold the dust cover in place and remove the dust cover.

c. For 115-volt operation remove jumper on T307 (see figure 5-4) between terminals 2 and 3. Connect jumpers between 1 and 2, 3 and 4.

d. For 230-volt operation remove jumpers on T307 between terminals 1 and 2, 3 and 4. Connect jumper between 2 and 3.

e. Remove the reversible designation plate from the rear of the dust cover. Turn it over and replace.

f. Put the dust cover back on the receiver and tighten the captive screws.

3-19. PLACEMENT OF RECEIVER INTO RACK. Lift the receiver to the level of the chassis supports of Rack MT-686/GR and slide the receiver into the rack until the front panel edges are in close contact with the front channels of the rack. Secure the front panel to the rack with the 5/8 inch 12-24 Phillips head machine screws and No. 12 flat washers furnished with the rack.

3-20. ANTENNA SYSTEM.

3-21. The antenna system for the receiver consists of Antenna Assembly AT-197/GR or AS-505/GR and interconnecting r-f cable(s). If the receiver is used in conjunction with Radio Transmitter Set AN/GRT-3, an antenna transfer cable assembly is used between the receiver and transmitter. If the receiver is used independently, the antenna transfer cable assembly is replaced by two r-f cable assemblies. (See figure 3-10.)

3-22. ANTENNA ASSEMBLY AT-197/GR. (See figure 3-6.) Antenna Assembly AT-197/GR is an omni-directional disc-cone type antenna with a gain approximately the same as that of a half wave dipole tuned to maximum efficiency; however, no tuning is required for operation over the entire frequency range of 225 mc to 400 mc.

3-23. Antenna Assembly AT-197/GR is composed of a simulated disc and cone separated by a glass insulator. The disc and cone sections of the antenna are formed by protruding lengths of hollow, round stock. The disc, or upper radiator assembly, is mounted horizontally

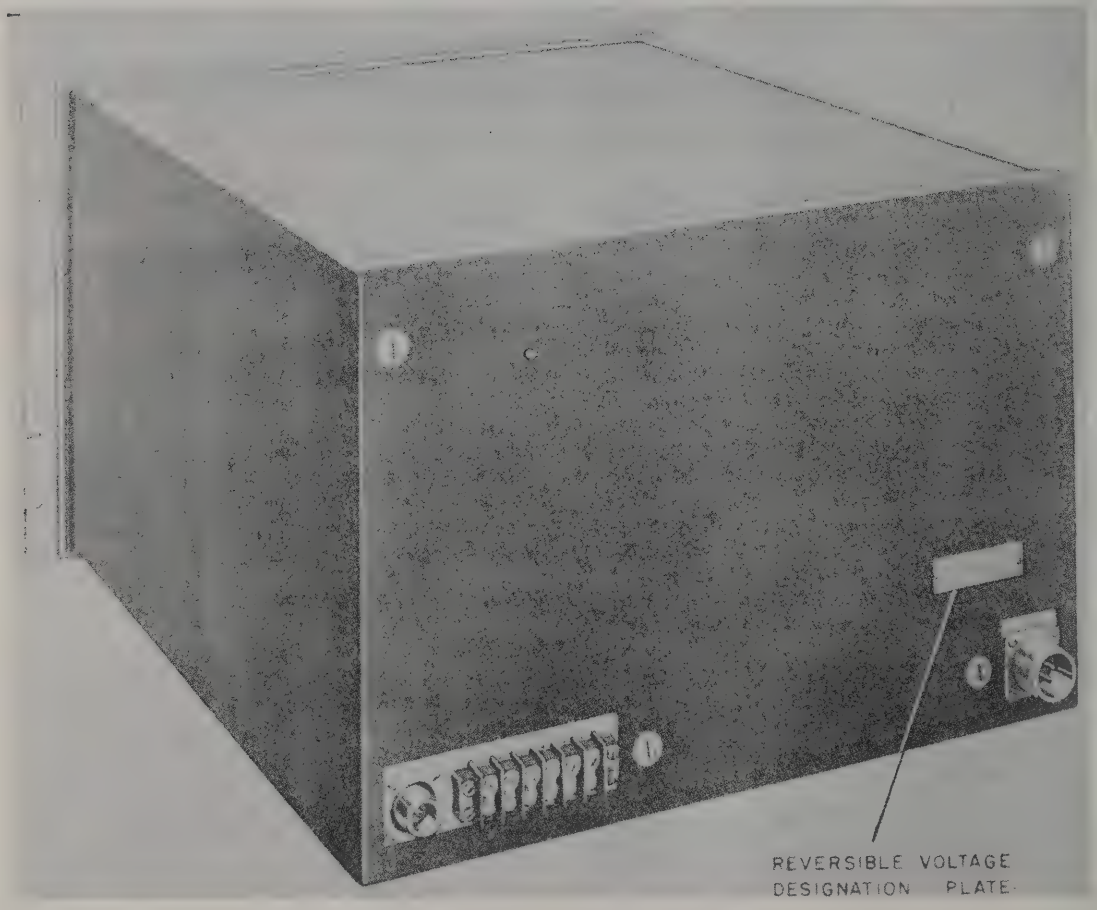


Figure 3-5. Radio Receiver R-361/GR, Rear View, Dust Cover On

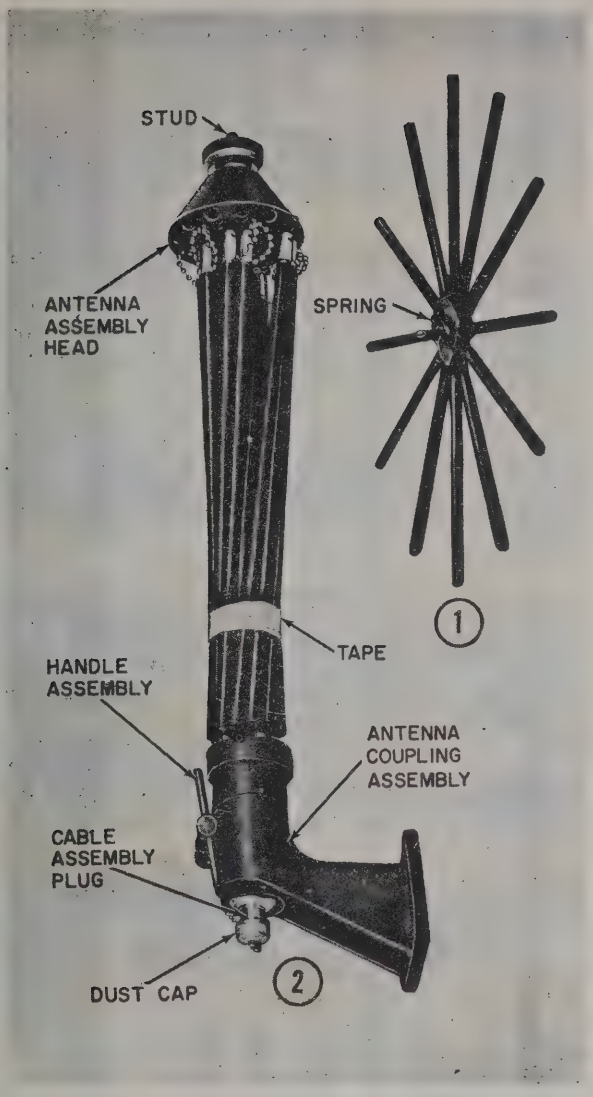


Figure 3-6. Antenna Assembly AT-197/GR, Disassembled for Shipment

above the simulated cone. The cone, or antenna assembly head, is fitted with 12 rods. In the disassembled state, these rods are attached to the lower head by means of flexible ball chains and are secured to the antenna support assembly tube by a band of tape or two web straps. One end of each rod is equipped with a Dzus type fastener by which it may be attached to the lower head. The use of metal rods decreases the weight and surface area and therefore greatly reduces the wind resistance. The disc, or upper radiator assembly, which is composed of 12 rods screwed into a cap at equal intervals about the circumference, fastens to the cone by means of Dzus fasteners. The antenna support assembly tube slides into the antenna coupling assembly, where it is secured by a screw-type clamp. The antenna normally mounts on the crossarm of Mast AB-158/GR, each of the three mounting holes on the coupling accommodating one of the members of the serpentine-type crossarm; it may also be secured by means of lag screws at the top of a wooden pole or

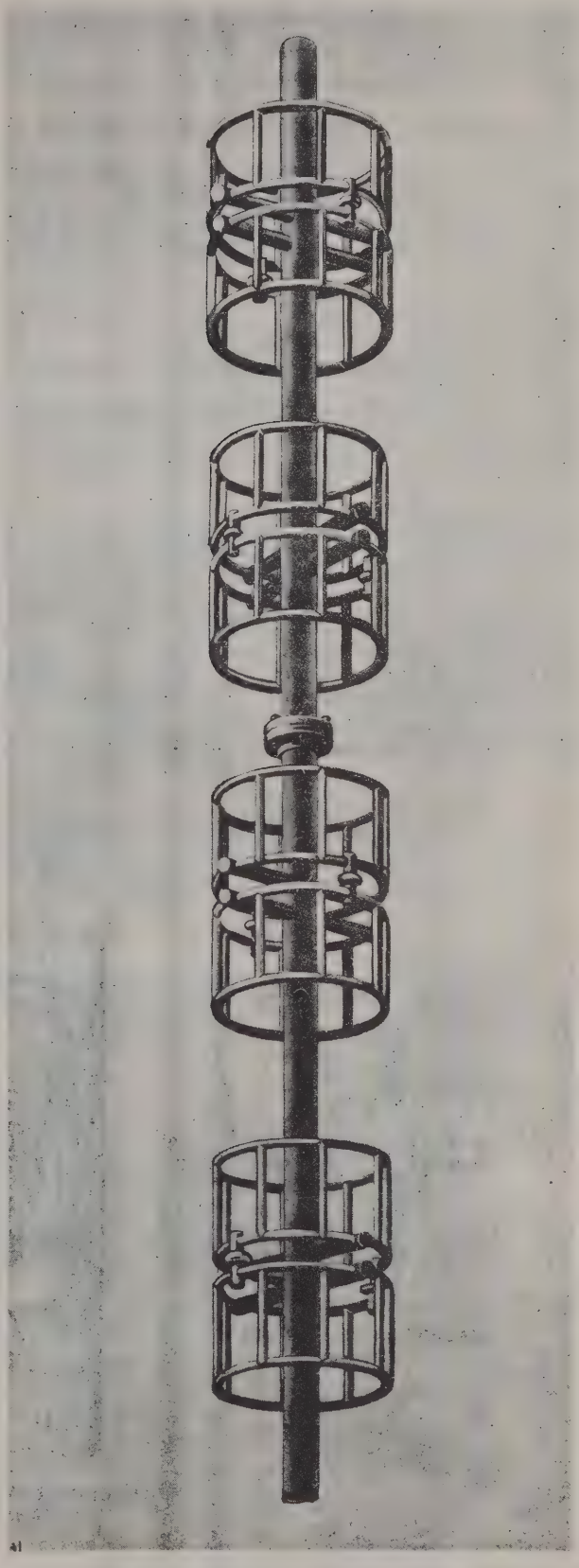


Figure 3-7. Antenna AS-505/GR

structure. Mast AB-158/GR will accommodate four of these antennas plus one Antenna AS-505/GR. The coaxial transmission line is led up through the disc, while the outer conductor is terminated at the apex of the cone.

3-24. Assemble Antenna Assembly AT-197/GR as follows:

a. Remove the tape or web straps securing the cone rods to the antenna support assembly tube.

b. Assemble the cone by inserting the 12 cone rods into the 12 sockets, locking them in place with a one-quarter turn.

c. Place the simulated disc on the top end of the antenna main body and secure it in place by a one-quarter turn of the disc on the Dzus type fastener.

d. Secure the antenna coupling assembly to the cross-arm or tower.

e. Insert the lower end of the antenna support assembly tube into the antenna coupling assembly and tighten the screw clamp to secure the antenna in position.

f. Remove the dust cap from the lower end of the antenna support assembly tube.

g. Secure the r-f cable to the mast and connect it to the coaxial fitting on the lower end of the tube.

h. Normally, Antenna Assembly AT-198/GR is supplied with the cable already installed within the antenna support assembly tube and with a connector fitted to the lower end of the cable, at the bottom of the tube, so that no cable work is necessary before installation and operation of the antenna. If it is necessary to fabricate a new plug, however, refer to paragraph 3-27. If fabrication necessitates disassembly of internal components of the antenna assembly, refer to the Handbook of Overhaul Instructions for the equipment.

NOTE

The connector on the end of the RG-17/U cable for installation within the tube of Antenna Assembly AT-197/GR is Plug UG-333A/U or Plug UG-334A/U.

3-25. ANTENNA AS-505/GR (See figures 3-7 and 3-8.) Antenna AS-505/GR is a four bay stacked vertical array consisting of four squirrel-cage type antennas mounted on a vertical column three inches in diameter. The bays are mounted on the column by metallic supports which serve as insulators due to the configuration of the antennas and the electrical lengths of the elements. Each bay is in effect a vertically polarized wide-band dipole and is fed at two points to obtain omni-directional radiation in the horizontal plane. The beam lobe is tilted upward at an angle of 5.5 degrees.

3-26. Antenna AS-505/GR is shipped in a wooden crate about ten feet long. Cradle supports at each end of the crate support the column to prevent damage to the antenna. Open the top of the crate being careful not to damage the crate or its contents. The crate should be saved for future shipping of the antenna. Check all items for possible damage. Hazard lights may be attached to one Antenna AS-505/GR when several are grouped in one location. Referring to figure 3-8,

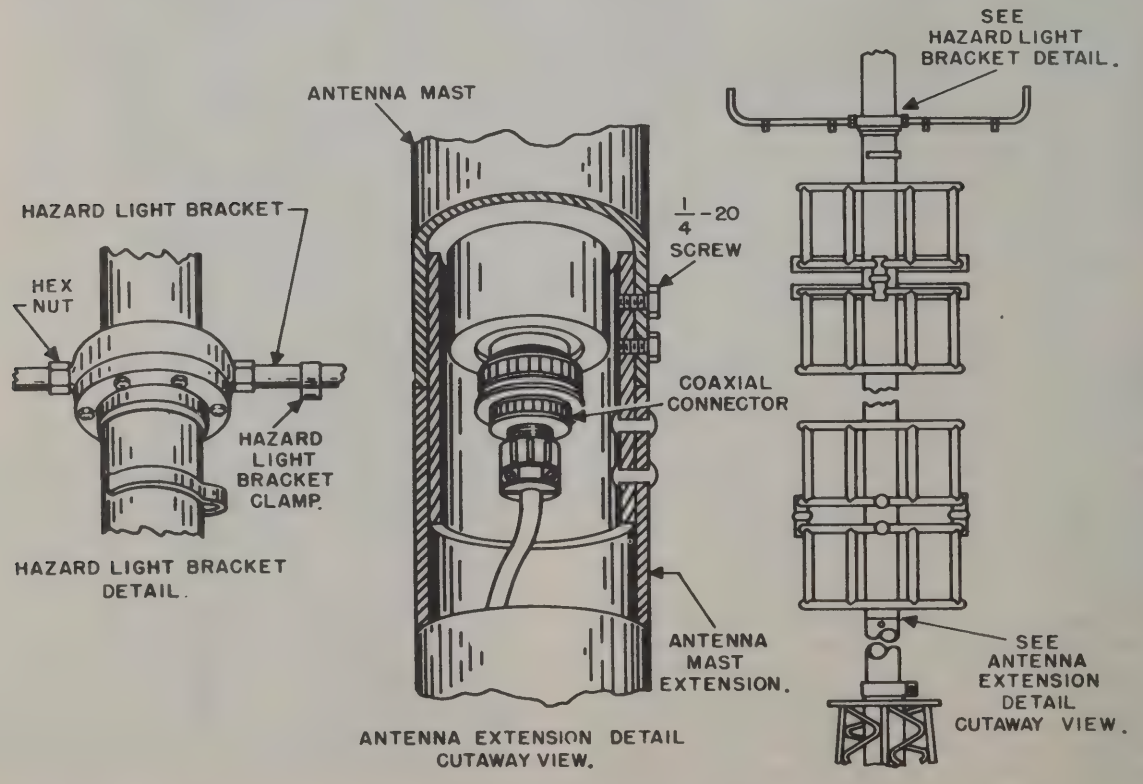


Figure 3-8. Antenna AS-505/GR, Assembly

assembly of the antenna (with hazard lights) is as follows:

a. Screw one hex nut onto each hazard light bracket as far as possible.

b. Screw the long end of each of the two hazard light brackets into the holes provided in the flange in the center of the antenna column as far as it will go.

c. Back the hex nuts up against the antenna mast to lock the bracket securely.

d. Attach hazard lights to the brackets and fasten the a-c cord by means of clips provided to the brackets and the column.

e. Carry mast extension to the top of Mast AB-158/GR and pass the end of R-F Cable CG-597/U through the extension so that the end emerges through the end that has the insert riveted within.

f. Use a piece of wire or light rope to tie the end of the r-f cable to the mast so that it will not fall away.

g. Set the mast extension in the receptacle provided for it on top of Mast AB-158/GR.

h. Tighten the clamp securely around the column shank.

i. Use a gin pole or other lifting contrivance to lift the antenna into a vertical position above the mast extension.

j. Connect the r-f feed cable connector to the connector within the antenna column.

k. Lower the antenna onto the mast extension and rotate it until the holes line up with the tapped holes in the insert.

l. Use six 1/4-20 machine screws to connect the antenna to the insert. Bolt down securely.

m. This completes the installation of Antenna AS-505/GR.

3-27. ANTENNA TRANSMISSION LINE. The parts for the r-f cable between the receiver and the antenna (when used independently), or, from the transmitter (in complete send-receive systems), are in bulk form. To fabricate this cable, affix one connector UG-495/U to each end of the required length of RG-17/U coaxial transmission line. The cable should be no longer than is necessary to reach from the receiver (or transmitter) to the antenna. Figure 3-9 shows the procedure for mounting the connectors on the ends of the cables. When installing the cables, make all bends with large radii. Since the RG-17/U cable is too stiff to make the turn required from the mounting rack (MT-686/GR) to the rear panel of the receiver or transmitter, a two foot cable of small diameter, CG-707/U, is used for attaching to the end of cable 597/U. This two foot extension cable is complete with proper connector plugs.

3-28. CABLE CONNECTIONS. (See figure 3-10.)

3-29. If the receiver is used in conjunction with Radio Transmitter T-282/GR, two interconnecting cables are required in addition to power and speaker cables. An antenna transfer cable assembly (see figure 3-11) connects the "ANT. INPUT" jack J401 on the rear of the receiver to the "ANT. INPUT" jack J907 on the rear of the transmitter; the antenna, AT-197/GR or AS-505/GR, is then switched from the transmitter to the receiver by the operation of the antenna transfer relay within the transmitter. A muting cable assembly (see figure 3-12) connects the "MUTING"

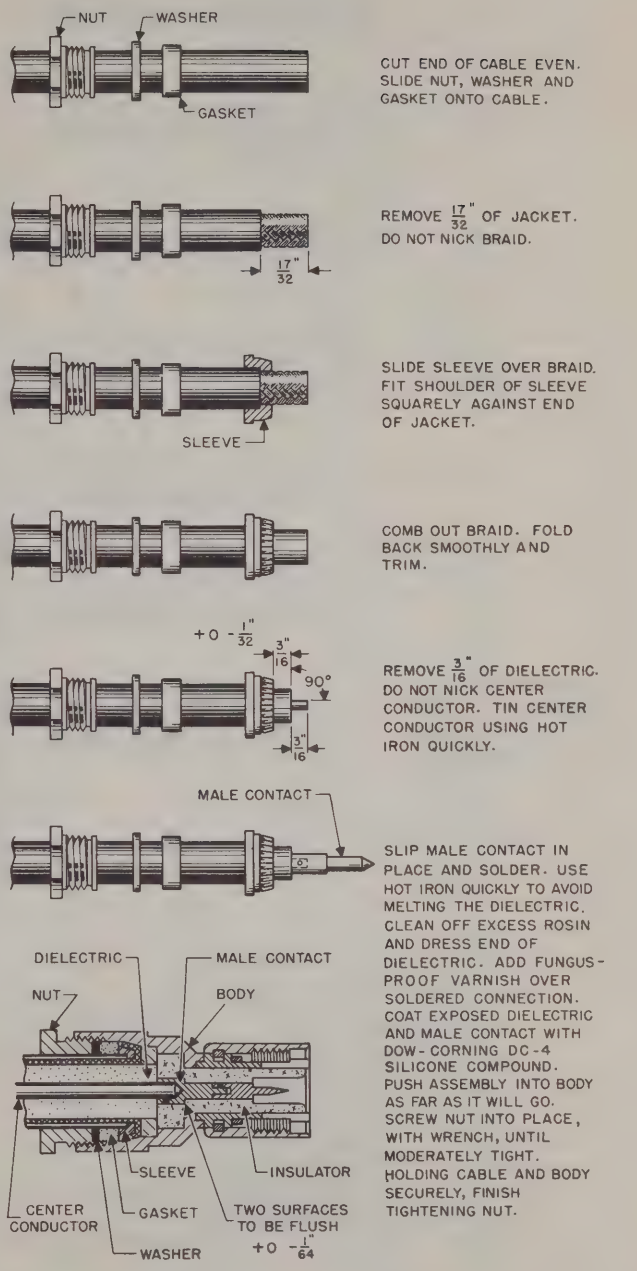
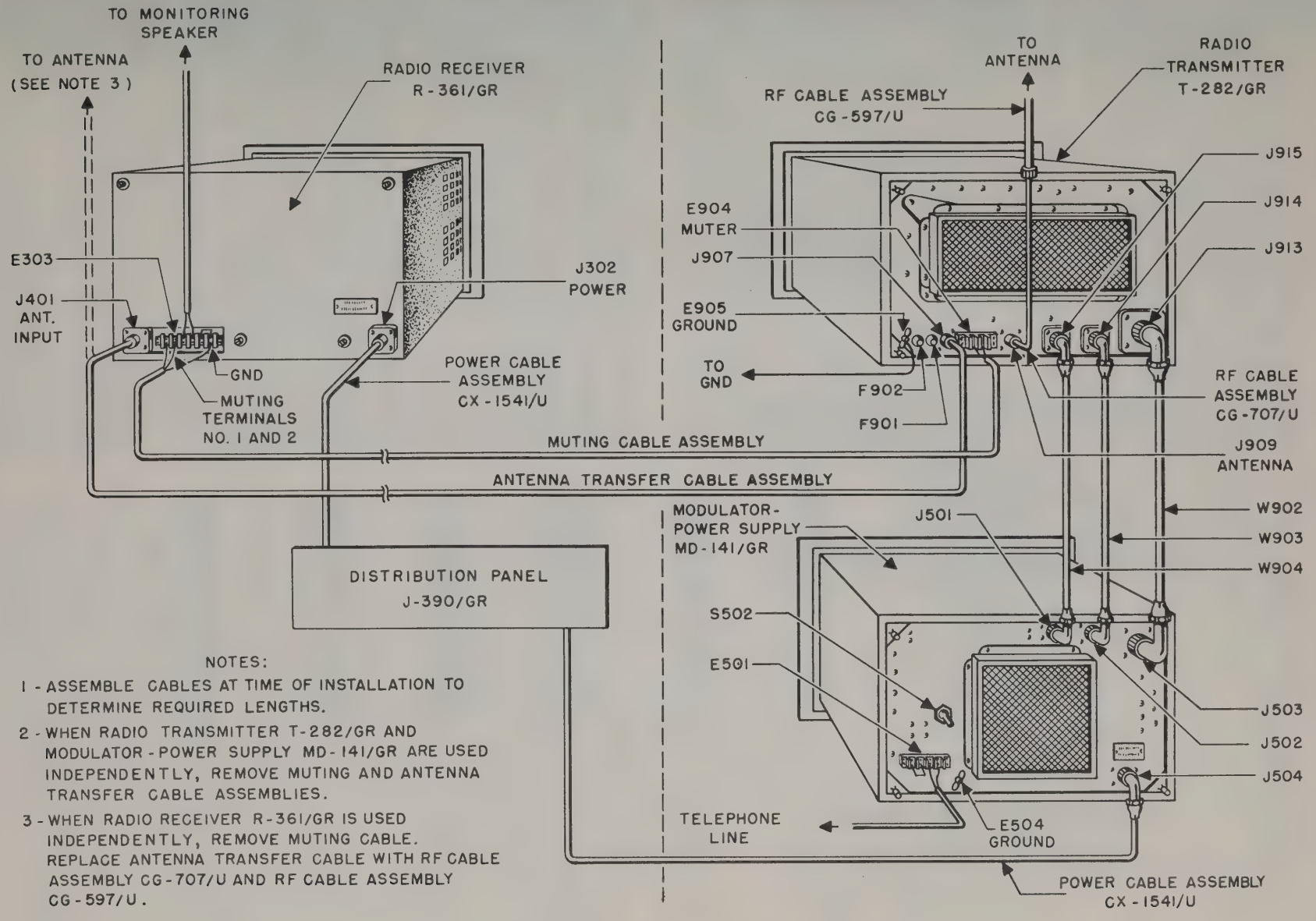

NUT
WASHER
GASKET
CUT END OF CABLE EVEN. SLIDE NUT, WASHER AND GASKET ONTO CABLE.
17/32"
REMOVE 17/32" OF JACKET. DO NOT NICK BRAID.
SLEEVE
SLIDE SLEEVE OVER BRAID. FIT SHOULDER OF SLEEVE SQUARELY AGAINST END OF JACKET.
COMB OUT BRAID. FOLD BACK SMOOTHLY AND TRIM.
+0 -1/32"
3/16"
90°
REMOVE 3/16" OF DIELECTRIC. DO NOT NICK CENTER CONDUCTOR. TIN CENTER CONDUCTOR USING HOT IRON QUICKLY.
MALE CONTACT
SLIP MALE CONTACT IN PLACE AND SOLDER. USE HOT IRON QUICKLY TO AVOID MELTING THE DIELECTRIC. CLEAN OFF EXCESS ROSIN AND DRESS END OF DIELECTRIC. ADD FUNGUS-PROOF VARNISH OVER SOLDERED CONNECTION. COAT EXPOSED DIELECTRIC AND MALE CONTACT WITH DOW-CORNING DC-4 SILICONE COMPOUND. PUSH ASSEMBLY INTO BODY AS FAR AS IT WILL GO. SCREW NUT INTO PLACE, WITH WRENCH, UNTIL MODERATELY TIGHT. HOLDING CABLE AND BODY SECURELY, FINISH TIGHTENING NUT.
DIELECTRIC
MALE CONTACT
NUT
BODY
SLEEVE
INSULATOR
CENTER CONDUCTOR
GASKET
TWO SURFACES TO BE FLUSH
+0 -1/64"
WASHER

Figure 3-9. Radio Receiver R-361/GR, R-F Cable Assembly CG-597/U



NOTES:

1 - ASSEMBLE CABLES AT TIME OF INSTALLATION TO DETERMINE REQUIRED LENGTHS.

2 - WHEN RADIO TRANSMITTER T-282/GR AND MODULATOR-POWER SUPPLY MD-141/GR ARE USED INDEPENDENTLY, REMOVE MUTING AND ANTENNA TRANSFER CABLE ASSEMBLIES.

3 - WHEN RADIO RECEIVER R-361/GR IS USED INDEPENDENTLY, REMOVE MUTING CABLE. REPLACE ANTENNA TRANSFER CABLE WITH RF CABLE ASSEMBLY CG-707/U AND RF CABLE ASSEMBLY CG-597/U.

Figure 3-10. Radio Receiver R-361/GR, Cable Connections

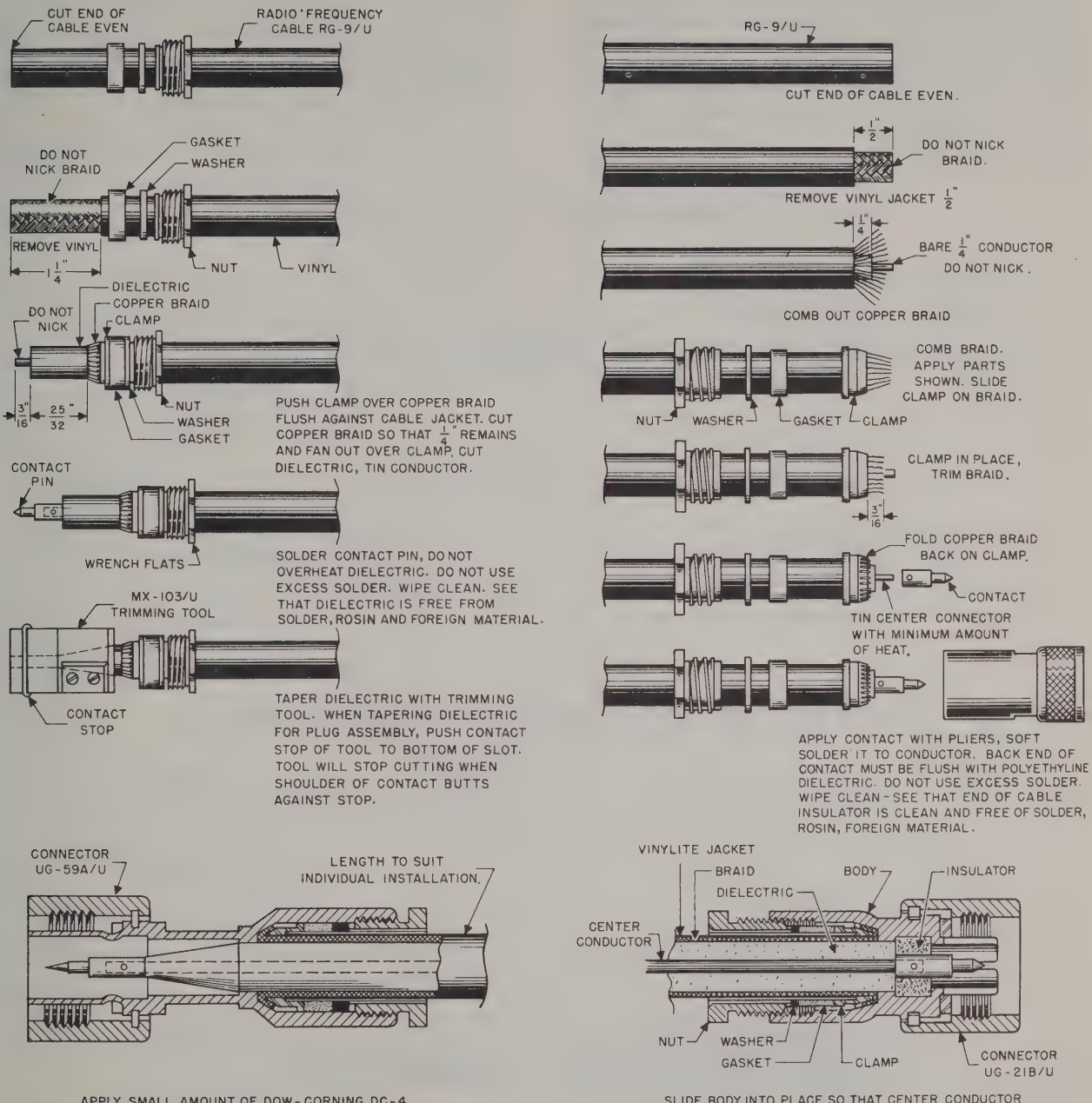

CUT END OF CABLE EVEN
RADIO FREQUENCY CABLE RG-9/U
DO NOT NICK BRAID
GASKET
WASHER
REMOVE VINYL
1 1/4"
NUT
VINYL
DIELECTRIC
COPPER BRAID
CLAMP
DO NOT NICK
3/16"
25/32"
NUT
WASHER
GASKET
PUSH CLAMP OVER COPPER BRAID FLUSH AGAINST CABLE JACKET. CUT COPPER BRAID SO THAT 1/4" REMAINS AND FAN OUT OVER CLAMP. CUT DIELECTRIC, TIN CONDUCTOR.
CONTACT PIN
WRENCH FLATS
SOLDER CONTACT PIN, DO NOT OVERHEAT DIELECTRIC. DO NOT USE EXCESS SOLDER. WIPE CLEAN. SEE THAT DIELECTRIC IS FREE FROM SOLDER, ROSIN AND FOREIGN MATERIAL.
MX-103/U TRIMMING TOOL
CONTACT STOP
TAPER DIELECTRIC WITH TRIMMING TOOL. WHEN TAPERING DIELECTRIC FOR PLUG ASSEMBLY, PUSH CONTACT STOP OF TOOL TO BOTTOM OF SLOT. TOOL WILL STOP CUTTING WHEN SHOULDER OF CONTACT BUTTS AGAINST STOP.
RG-9/U
CUT END OF CABLE EVEN.
1/2"
DO NOT NICK BRAID.
REMOVE VINYL JACKET 1/2"
1/4"
BARE 1/4" CONDUCTOR DO NOT NICK.
COMB OUT COPPER BRAID
COMB BRAID. APPLY PARTS SHOWN. SLIDE CLAMP ON BRAID.
NUT
WASHER
GASKET
CLAMP
CLAMP IN PLACE, TRIM BRAID.
3/16"
FOLD COPPER BRAID BACK ON CLAMP.
CONTACT
TIN CENTER CONNECTOR WITH MINIMUM AMOUNT OF HEAT.
APPLY CONTACT WITH PLIERS, SOFT SOLDER IT TO CONDUCTOR. BACK END OF CONTACT MUST BE FLUSH WITH POLYETHYLINE DIELECTRIC. DO NOT USE EXCESS SOLDER. WIPE CLEAN - SEE THAT END OF CABLE INSULATOR IS CLEAN AND FREE OF SOLDER, ROSIN, FOREIGN MATERIAL.
CONNECTOR UG-59A/U
LENGTH TO SUIT INDIVIDUAL INSTALLATION.
APPLY SMALL AMOUNT OF DOW-CORNING DC-4 SILICONE COMPOUND, OR EQUIVALENT, ON TAPERED DIELECTRIC. INSERT ASSEMBLY INTO CONNECTOR BODY. TIGHTEN NUT WITH WRENCH.
VINYLITE JACKET
BRAID
DIELECTRIC
BODY
INSULATOR
CENTER CONDUCTOR
NUT
WASHER
GASKET
CLAMP
CONNECTOR UG-21B/U
SLIDE BODY INTO PLACE SO THAT CENTER CONDUCTOR CONTACT ENTERS HOLE IN INSULATOR. FACE OF CABLE DIELECTRIC MUST FIT FLUSH AGAINST INSULATOR. PROPERLY TIGHTEN BODY AND NUT WITH WRENCH.

Figure 3-11. Radio Receiver R-361/GR, Antenna Transfer Cable Assembly

terminals on the rear of the receiver to the "MUTER" terminals on the rear of the transmitter; when "transmitting", shorting contacts on the push-to-talk relay, within the transmitter, silence the receiver by placing a short-circuit across its audio output. Two power cables are required, one from the "POWER" jack J302 on the rear of the receiver to the horizontal metallic bars on Distribution Panel J-390/GR used for primary power distribution, the other from the convenience outlet on the rear of the distribution panel to the nearest junction box or other source of primary power. (See figure 3-13.) Connect a two-wire cable from the "MONITOR" terminals if local or remote audio output is desired from the rear of the receiver; audio output is also available on the front panel at the "AUDIO OUTPUT" jack J301.

3-30. If the receiver is not used in conjunction with a transmitter, the muting cable assembly is removed and the antenna transfer cable assembly replaced by two r-f cable assemblies. The "ANT. INPUT" jack J401 is then connected directly to the antenna. Refer to paragraph 3-27 for fabrication and installation details of the r-f cable assemblies.

3-31. Refer to Tables 3-4 and 3-5 as well as figure 3-10 for the required cables and their connection.

TABLE 3-4. CABLES REQUIRED WHEN USED WITH TRANSMITTER

Quantity	Name of Unit	Govt Type Designation	Description
1	Antenna Transfer Cable Assembly		Connects antenna to receiver through relay in transmitter.
1	Muting Cable Assembly		For silencing receiver during transmission.
1	Speaker Cable		Connects loudspeaker
1	Power Cable Assembly	CX-1541/U	A-c power line to Distribution Panel J-390/GR
1	Power Cable Assembly		From distribution panel to a-c supply.
1	Terminal Board Jumper		Grounds secondary center-tap of audio output transformer.

TABLE 3-5. CABLES REQUIRED WHEN USED WITHOUT TRANSMITTER

Quantity	Name of Unit	Govt Type Designation	Description
1	R-F Cable Assembly	CG-597/U	R-f transmission line
1	R-F Cable Assembly	CG-707/U	Connection between "ANT. INPUT" jack J401 and CG-597/U.
1	Speaker Cable		Connects loudspeaker
1	Power Cable Assembly	CX-1541/U	A-c power line to Distribution Panel J-390/GR
1	Power Cable Assembly		From distribution panel to a-c supply.
1	Terminal Board Jumper		Grounds secondary center-tap of audio output transformer.

3-32. DISASSEMBLY AND PACKING. (See figure 3-1.)

3-33. The following instructions are recommended as a guide for preparing the receiver for transportation and storage.

a. Disconnect all outside field lines and power cords. Stow cordage on the floor of the shelter. Reel up all field wire.

b. Take down antenna and repack it (if complete station being dismantled). Reverse assembly instructions in paragraphs 3-20 through 3-24.

c. Reel up antenna cable on drum.

d. Disconnect ground wires.

e. Disconnect interconnecting cables between the receiver and Radio Transmitter T-282/GR.

f. Disconnect all other cables at rear of the equipment, reel up, and stow on floor of the shelter.

g. Dismantle Rack MT-686/GR and repack it (if complete station being dismantled). Reverse assembly instructions in paragraph 3-14.

h. The exact procedure in repacking for shipment or limited storage depends upon material available and the conditions under which the equipment is to be shipped or stored. Refer to paragraph 3-7 and reverse the instructions given therein.

i. Whenever practicable, place a dehydrating agent such as silica gel inside the packing boxes. Protect the inner boxes with a waterproof paper barrier. Seal the seams of the paper barrier with waterproof sealing compound or tape. Pack the protected boxes in a padded wooden case, providing at least 2 inches of excelsior padding or some similar material between the paper barrier and the packing case.

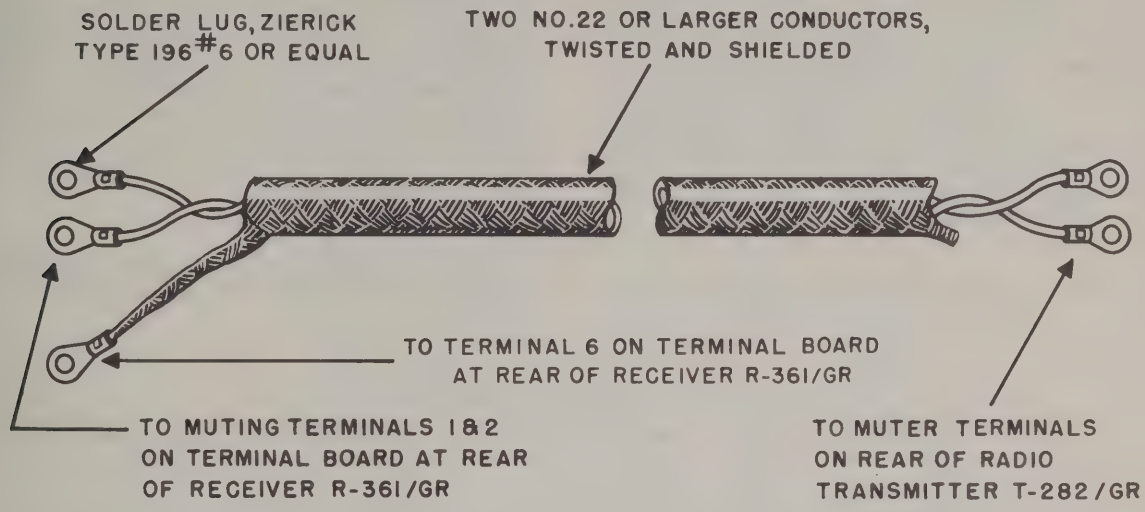

SOLDER LUG, ZIERICK
TYPE 196 #6 OR EQUAL
TWO NO.22 OR LARGER CONDUCTORS,
TWISTED AND SHIELDED
TO TERMINAL 6 ON TERMINAL BOARD
AT REAR OF RECEIVER R-361/GR
TO MUTING TERMINALS 1&2
ON TERMINAL BOARD AT REAR
OF RECEIVER R-361/GR
TO MUTER TERMINALS
ON REAR OF RADIO
TRANSMITTER T-282/GR

Figure 3-12. Radio Receiver R-361/GR, Muting Cable Assembly

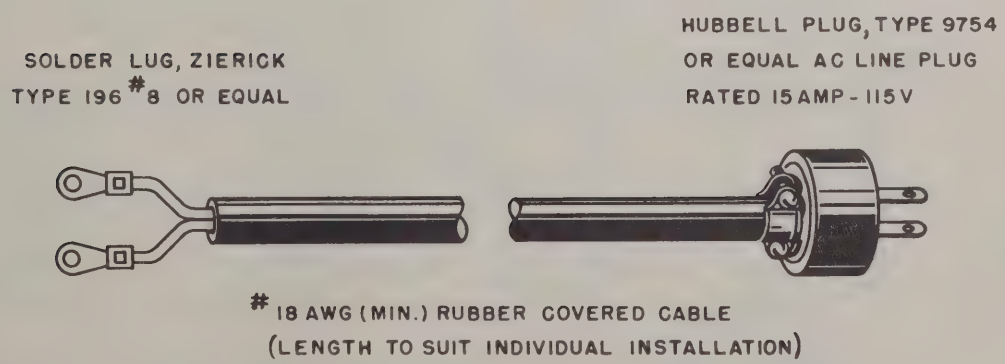

SOLDER LUG, ZIERICK
TYPE 196 #8 OR EQUAL
HUBBELL PLUG, TYPE 9754
OR EQUAL AC LINE PLUG
RATED 15 AMP - 115 V
18 AWG (MIN.) RUBBER COVERED CABLE
(LENGTH TO SUIT INDIVIDUAL INSTALLATION)

Figure 3-13. Radio Receiver R-361/GR, Power Cable Assembly

SECTION IV

THEORY OF OPERATIONS

4-1. GENERAL SYSTEMS OPERATION.

4-2. Electrically, the receiver consists of signal circuits and auxiliary circuits. Mechanically, the receiver consists of the front panel, on which are mounted the operating controls; the r-f subassembly which contains the electrical components that comprise the r-f amplifiers and first mixer; the oscillator subassembly which contains the electrical components that comprise the local oscillator circuits; and the main chassis which contains input and output connectors, as well as electrical components that make up the balance of the receiver.

4-3. Incoming signals, after being amplified by the r-f section, (see figure 4-1) are hetrodyned against the signal from the first oscillator and its multiplier chain. The difference frequency, the first i-f (40.4 mc), is then heterodyned against the signal from the second oscillator (34.4 mc), and the difference frequency, 6 mc, is fed through 6-mc i-f amplifiers. After detection, the audio component of the original signal passes through the audio section and is made available for aural reception at suitable connectors on the front and rear of the receiver. The auxiliary circuits provided are automatic volume control (avc), squelch, and noise limiting.

4-4. SIGNAL CIRCUITS. (See figure 4-1.) Table 4-1 lists the signal circuits, their location, and function.

TABLE 4-1. SIGNAL CIRCUITS

Name	Location	Function
R-f section 1st mixer	RF subassembly	3 stages of amplification provide the required image rejection and gain prior to the 1st mixer stage.
1st oscillator and multiplier chain	Oscillator subassembly	Adequate stability is provided by limiting the crystal freq to the range from 20 to 40 mc. Multipliers provide the required output freq for heterodyning against the incoming sig from the antenna. Since the 1st i-f freq is 40.4 mc, the exact crystal freq in mc can be calculated as follows: $\text{crystal freq} = \frac{\text{radio freq} - 40.4}{9}$
Second oscillator	Oscillator subassembly	Crystal controlled 34.4 mc oscillator heterodynes against 1st i-f freq (40.4 mc) to provide 2nd i-f freq (6 mc).
1st i-f 40.4 mc and 2nd mixer	Main chassis	Provides image rejection and conversion to 6 mc.
Second i-f 6 mc	Main chassis	Provides required selectivity and amplification.
Detector	Main chassis	Separates the audio component from the modulated carrier (6 mc).
1st audio amplifier	Main chassis	Amplifies detected signal.
2nd audio amplifier and power output	Main chassis	Provides one watt audio output at front panel phone jack and reduced output at terminals on rear of the receiver.

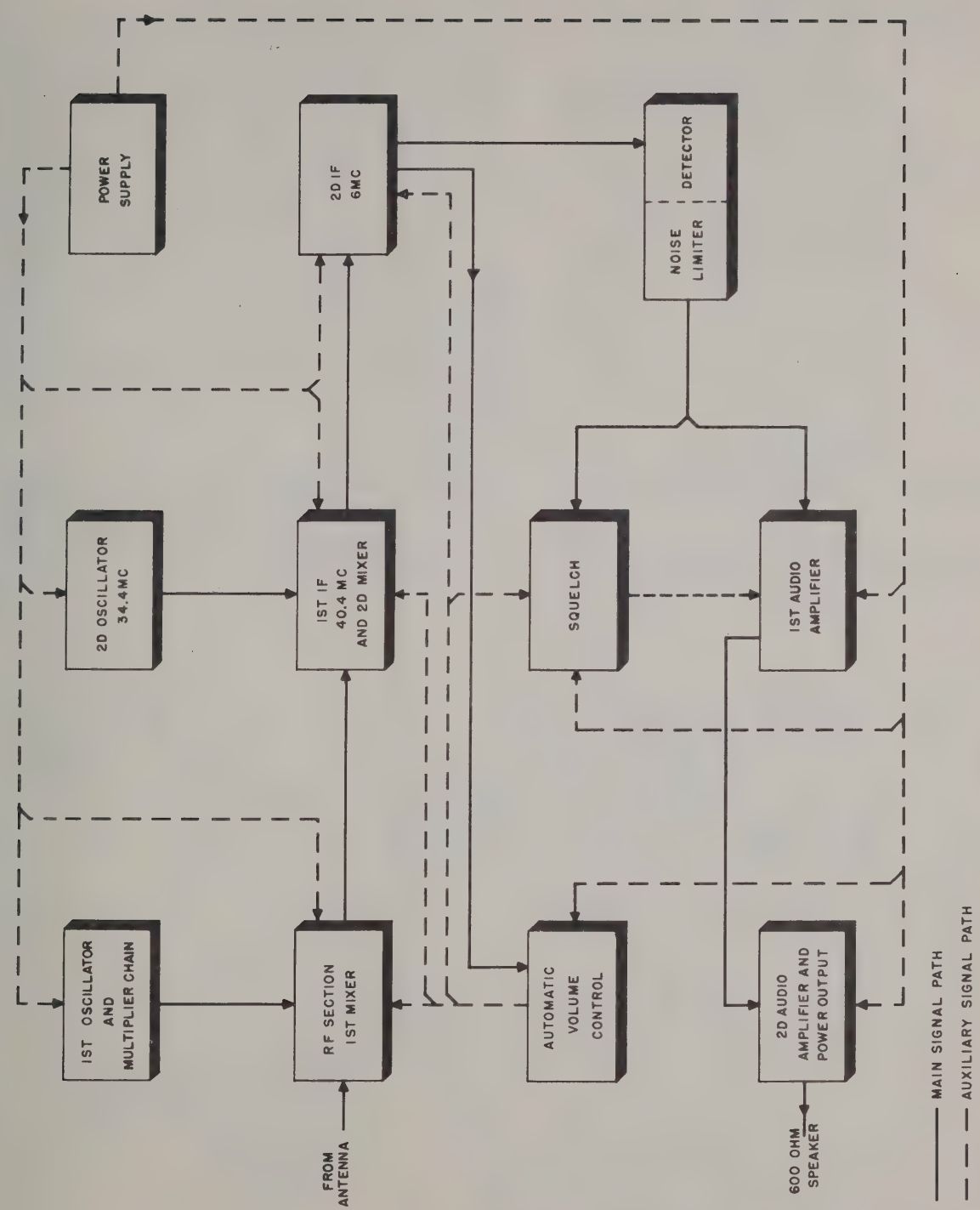


Figure 4-1. Radio Receiver R-361/GR, General System Block Diagram and Signal Sequence

4-5. AUXILIARY CIRCUITS. (See figure 4-1). The auxiliary circuits, outside the signal channels, and built into the main chassis of the receiver, are listed in Table 4-2.

TABLE 4-2. AUXILIARY CIRCUITS

Name	Function
Squelch	Silences receiver for signals below pre-determined level by biasing 1st audio amplifier beyond cut-off.
Automatic volume control	Amplified avc circuit with delay. The avc voltage is fed to the control grids of the r-f and i-f sections in such a manner that the avc characteristic is flat over the widest possible range of signal inputs to the antenna.
Noise limiter	Series type limiter with disabling switch reduces noise from pulses of short duration.
Power supply	Supplies all a-c and d-c voltages for the receiver.

4-6. FUNCTIONAL OPERATION OF ELECTRONIC COMPONENTS.

4-7. The following paragraphs provide a description and essential information on the function of each electrical part. The discussion is in the order of signal sequence and is further explained by simplified schematics. A detailed systems analysis of the receiver is included in this section commencing with paragraph 4-30.

4-8. FIRST R-F AMPLIFIER (V401). (See figure 4-2). The first r-f amplifier is composed of tube V401 and its associated circuits. Tube V401, a 6J4 type triode, is connected as a grounded grid amplifier. The signal from the antenna is introduced between cathode and ground. After entering the receiver through "ANT. INPUT" jack J401 the signal is coupled to antenna tank circuit, U401, through antenna input coupling capacitor C432. Cathode resistor R401 provides bias for tube V401 and is bypassed by capacitor C402. Capacitors C401 and C403 are grid bypass capacitors and resistor R403 is the avc decoupling resistor. L404 is an r-f choke for filament decoupling of V401. C404 is a filament r-f bypass capacitor. L401 is the shunt feed inductance for V401. R404 is the B+ decoupling resistor. Capacitor C406 is an r-f bypass. C407 is a plate coupling capacitor. U402 is the first r-f plate tank circuit. Resistors R402 and R408 comprise an avc voltage divider. C405 is the avc decoupling capacitor.

4-9. SECOND R-F AMPLIFIER (V402). (See figure 4-3.) R405 is a cathode bias resistor for V402. C409 is a cathode bypass for V402. C408 and C411 are the grid r-f bypass for V402. R406 is the grid bias decoupling resistor for V402. L406 and L407 are filament r-f chokes for V402. C410 is the filament

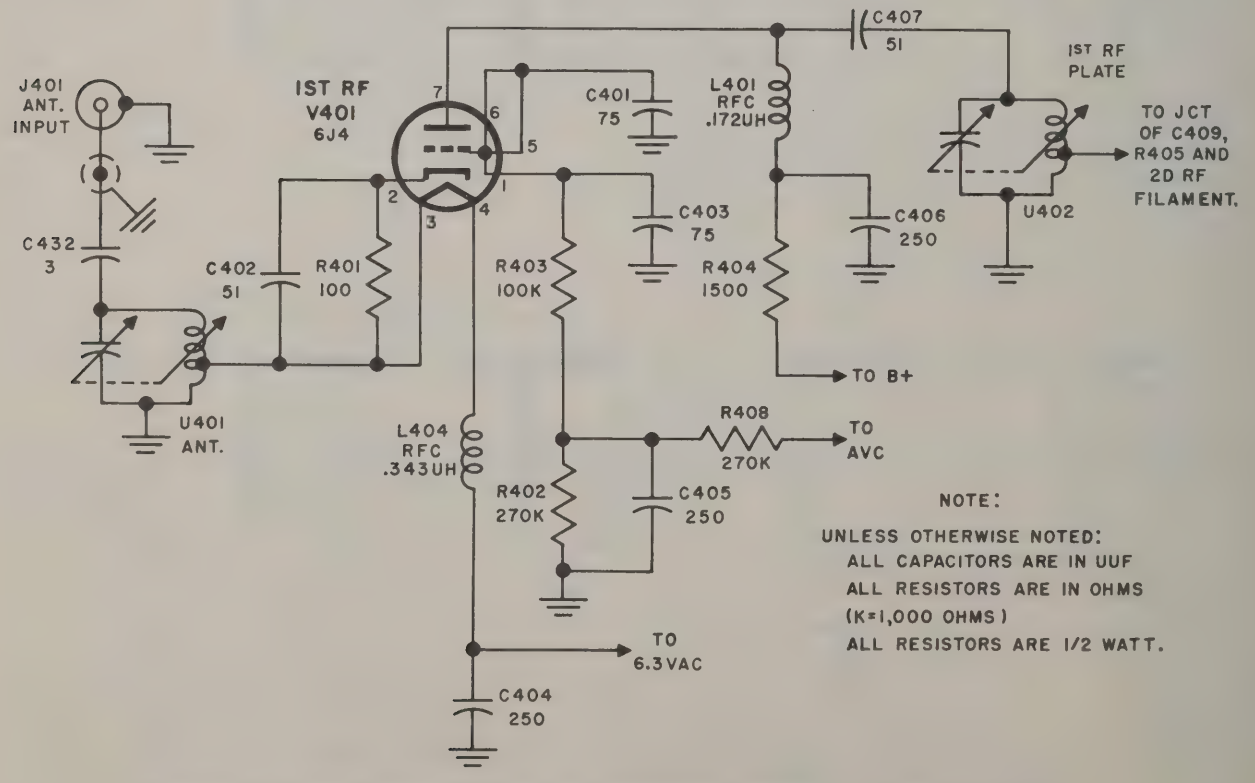


Figure 4-2. Radio Receiver R-361/GR, First R-F Amplifier, Simplified Schematic

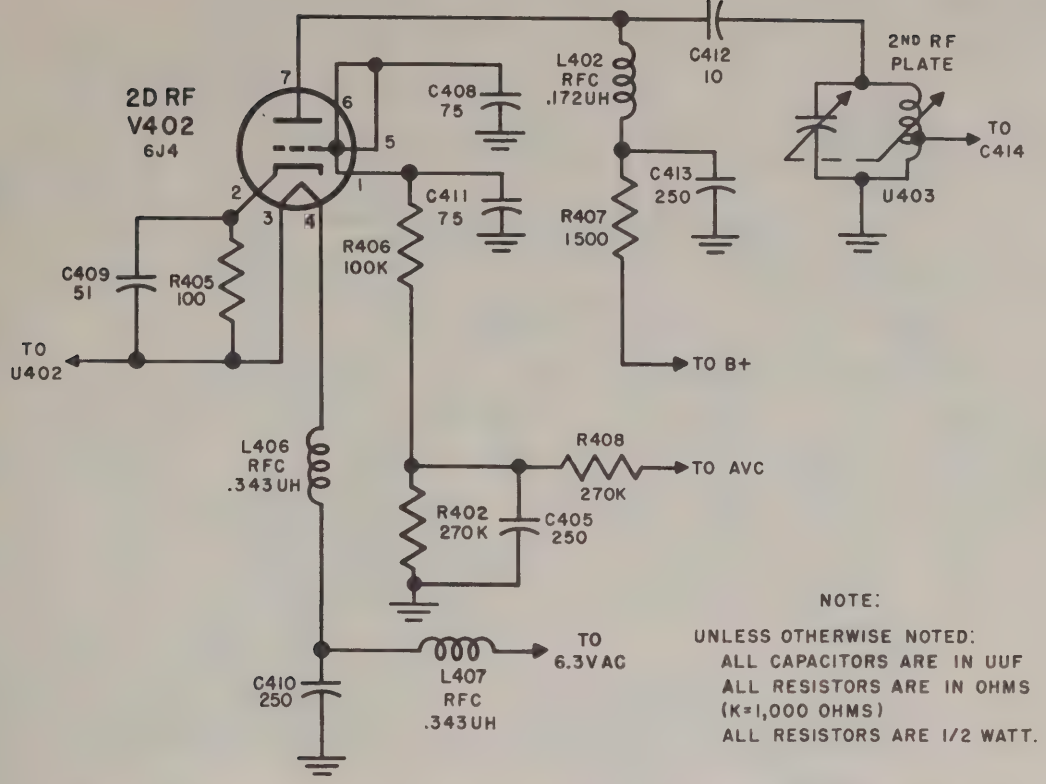


Figure 4-3. Radio Receiver R-361/GR, Second R-F Amplifier, Simplified Schematic

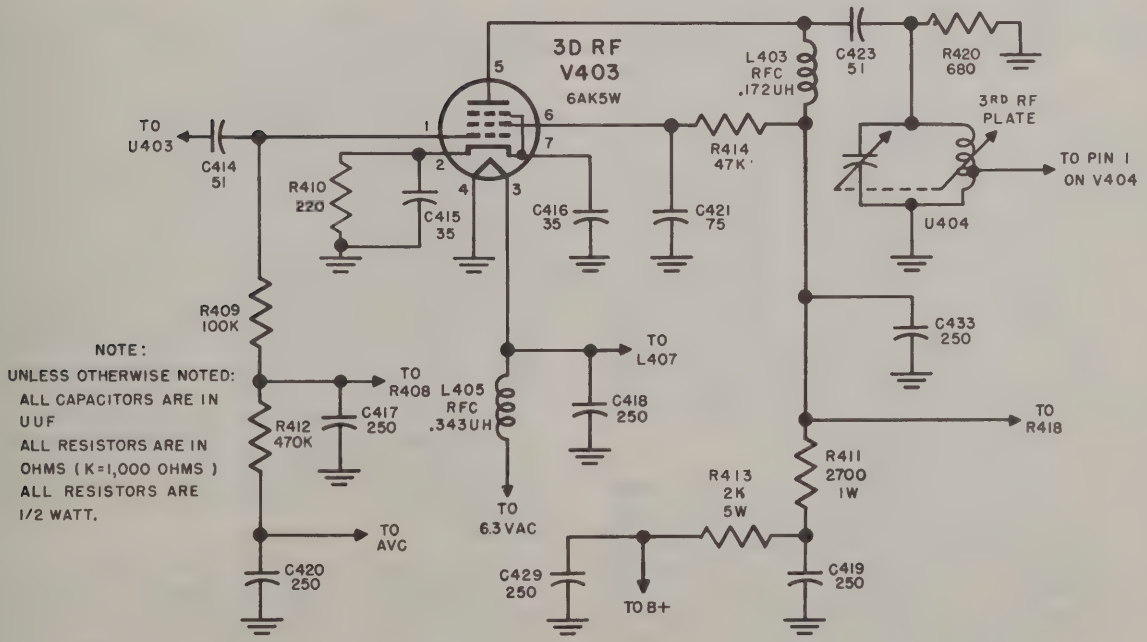


Figure 4-4. Radio Receiver R-361/GR, Third R-F Amplifier, Simplified Schematic

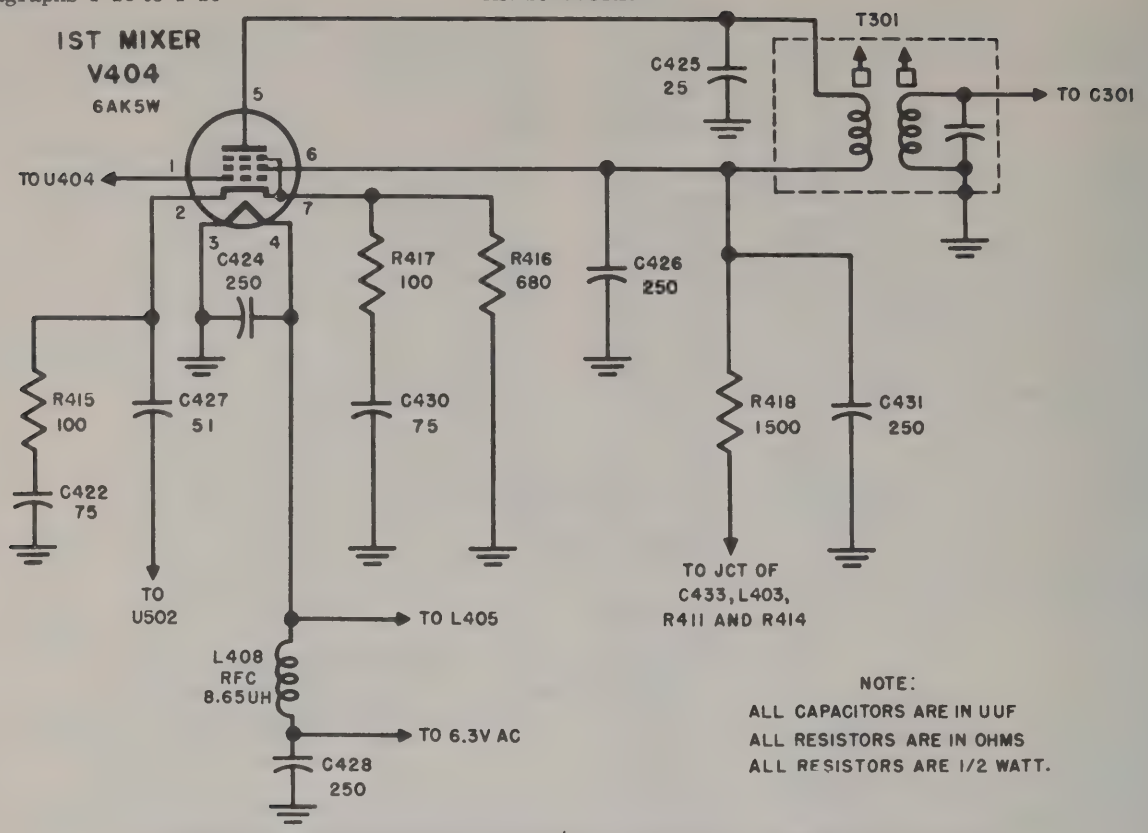


Figure 4-5. Radio Receiver R-361/GR, First Mixer, Simplified Schematic

r-f bypass. L402 is the shunt feed inductance for V402. C412 is the plate coupling capacitor. U402 is the second r-f tuned plate circuit. R407 is the B+ decoupling resistor. C413 is the plate bypass capacitor. Resistors R402 and R408 comprise an avc voltage divider.

4-10. THIRD R-F AMPLIFIER (V403). (See figure 4-4.) C414 is the coupling capacitor. R410 is the cathode bias resistor. C415 and C416 are cathode bypass capacitors. R409 is an avc decoupling resistor. R414 is a screen dropping resistor. C421 is a screen r-f bypass capacitor. L403 is a shunt feed r-f choke. R411 is the B+ decoupling resistor. C433 is the plate bypass capacitor. L405 is a filament r-f choke. C418 is a filament bypass capacitor. C423 is a plate coupling capacitor. R420 is a loading resistor for the third r-f plate tuned tank circuit U404. R412 is an avc filter resistor. C417 and C420 are avc decoupling capacitors. R413 is a B+ decoupling resistor. C419 and C429 are B+ decoupling capacitors.

4-11. FIRST MIXER (V404). (See figure 4-5). C424 and C428 are filament r-f bypass capacitors. L408 is an r-f filament choke. C426 and C431 are screen bypass capacitors. C425 is the 40.4 mc i-f tuning capacitor. R418 is a B+ decoupling resistor. C427 is the coupling capacitor to the first oscillator section. R416 is the cathode bias resistor. The two combinations R415, C422 and R417, C430 are used to maintain the impedance of the cathode at the proper value over the frequency range and without disturbing the bias. T301, (adjacent to r-f subassembly) is the first intermediate frequency transformer and is tuned to 40.4 mc.

4-12. FIRST OSCILLATOR AND FIRST TRIPLER. (See figure 4-6). R501 and R502 are cathode bias resistors. R503 is a parasitic resistor for V501A. C501 and L501 are elements of the "1st OSC" circuit for V501A. C502 and L502 are elements of the "1st TRIPL PLATE" circuit for V501B. C506 and C512 are plate bypass capacitors; R504 and R507 are plate decoupling resistors for V501A and V501B. L514 is an r-f choke and C532 the bypass capacitor for the filament. C505 is the coupling capacitor between the plate of V501A and the grid of V501B. R505 and R506 are grid bias resistors for V501B. J501 is a jack for metering the voltage developed across R505 and C507 is the meter bypass capacitor. Y501 is the oscillator crystal and A501 is its temperature controlled oven. L505 is the oscillator neutralizing inductance, tuned with the crystal holder capacity, to prevent spurious oscillation when the crystal fails. The tank circuit is made up of C502 and L502. B+ to the plate of V501B is decoupled by resistor R507 and bypassed by capacitor C512.

4-13. FIRST AMPLIFIER (V502). (See figure 4-7.) C513 is the grid coupling capacitor. R508 and R509 are grid bias resistors. R508 is also the first amplifier metering resistor, the voltage developed across it being available for metering through jack J502. R508 is bypassed by capacitor C508. C509 is the screen bypass capacitor. R526 is the screen dropping resistor. C503 and L503 are the elements of

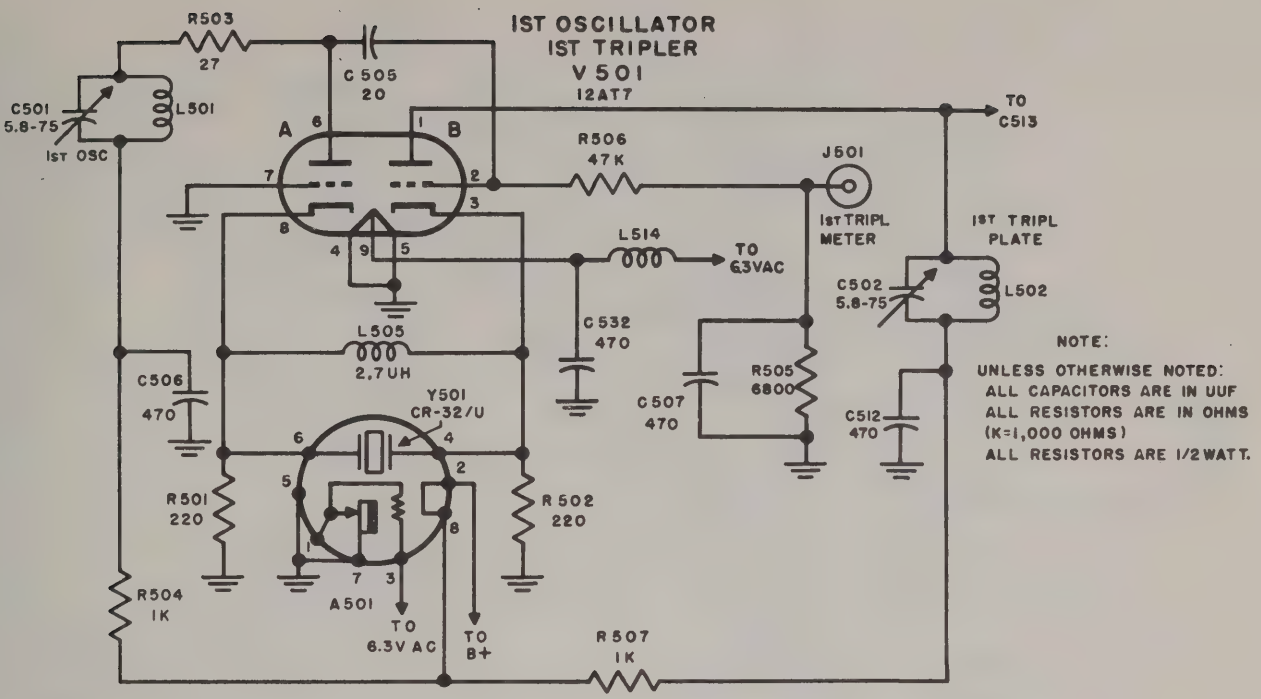


Figure 4-6. Radio Receiver R-361/GR, First Oscillator And First Tripler, Simplified Schematic

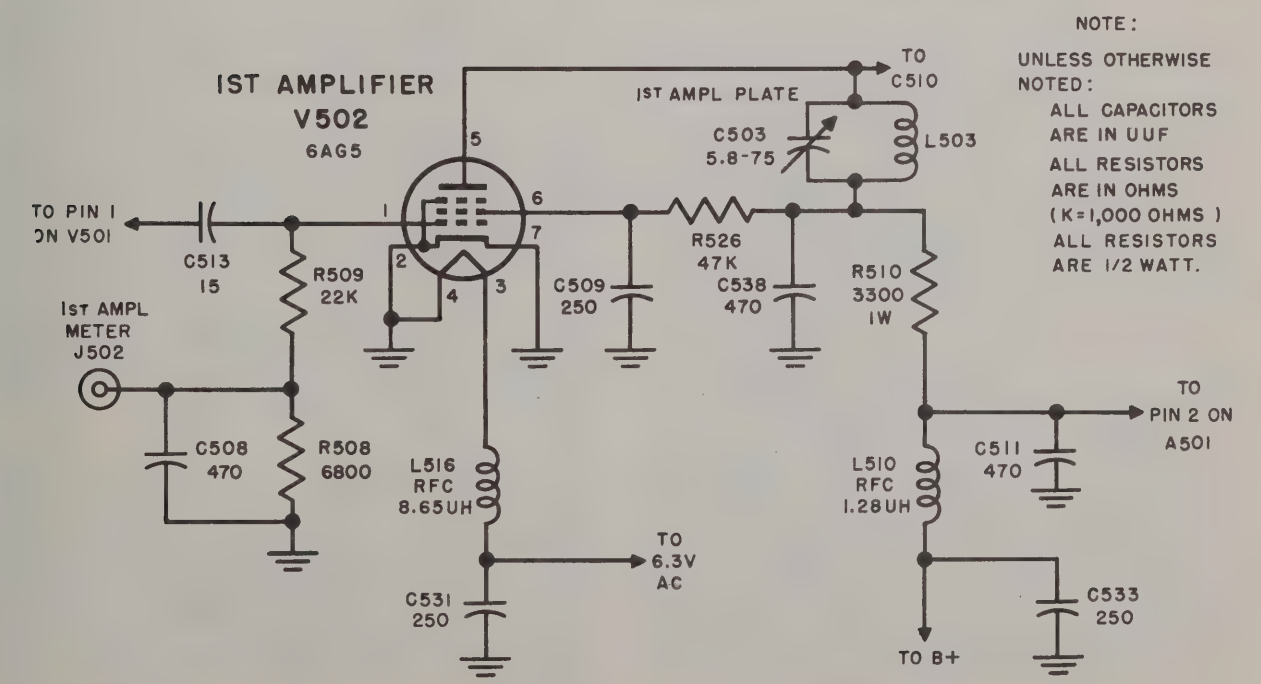


Figure 4-7. Radio Receiver R-361/GR, First Amplifier, Simplified Schematic

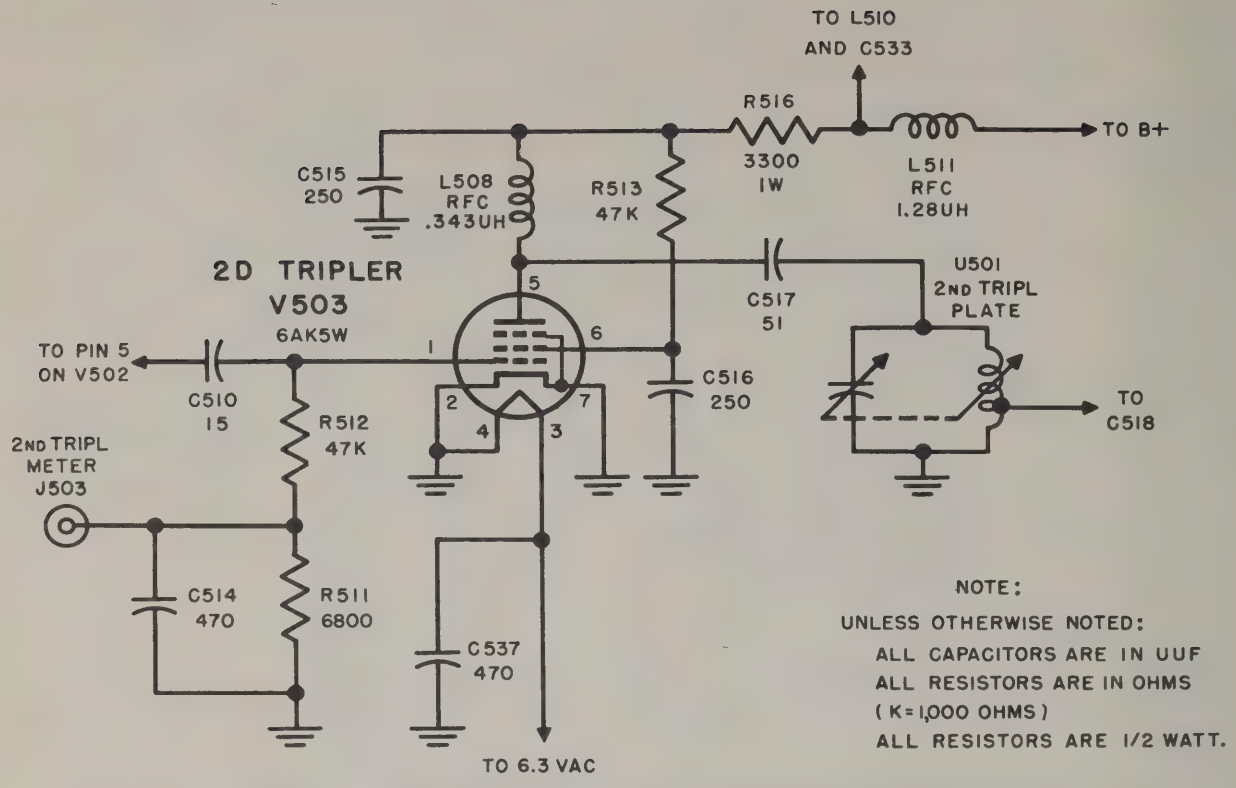


Figure 4-8. Radio Receiver R-361/GR, Second Tripler, Simplified Schematic

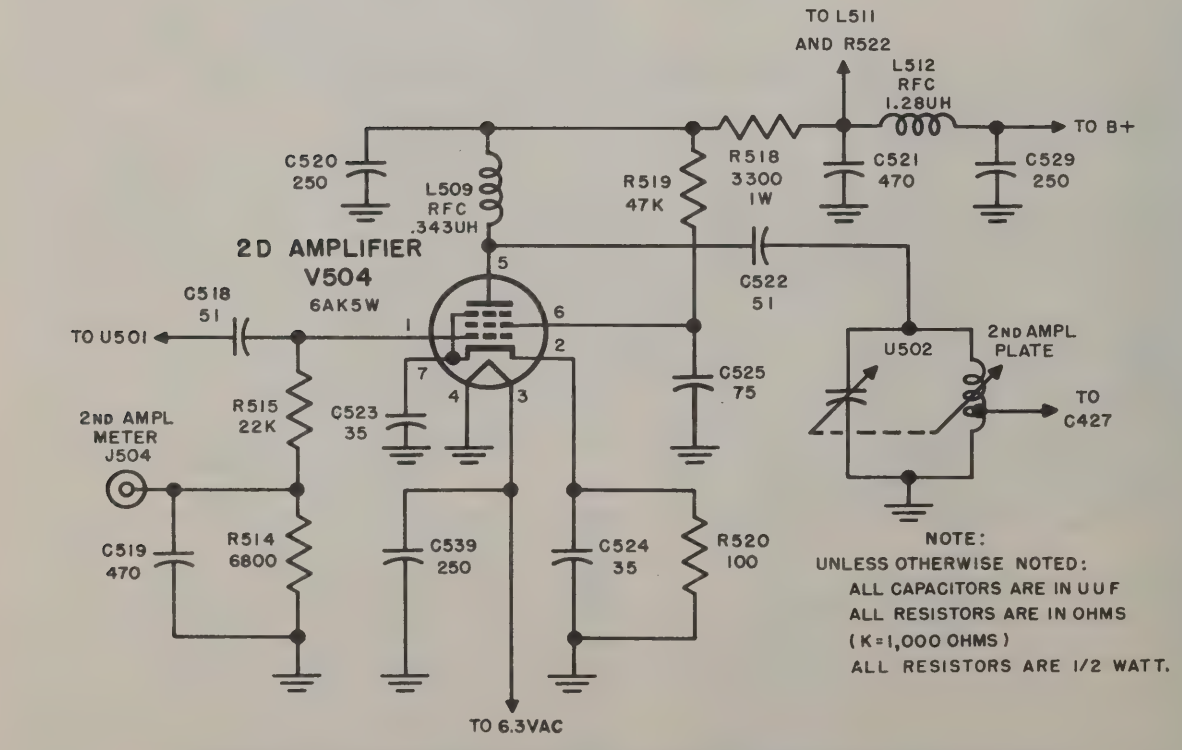


Figure 4-9. Radio Receiver R-361/GR, Second Amplifier, Simplified Schematic

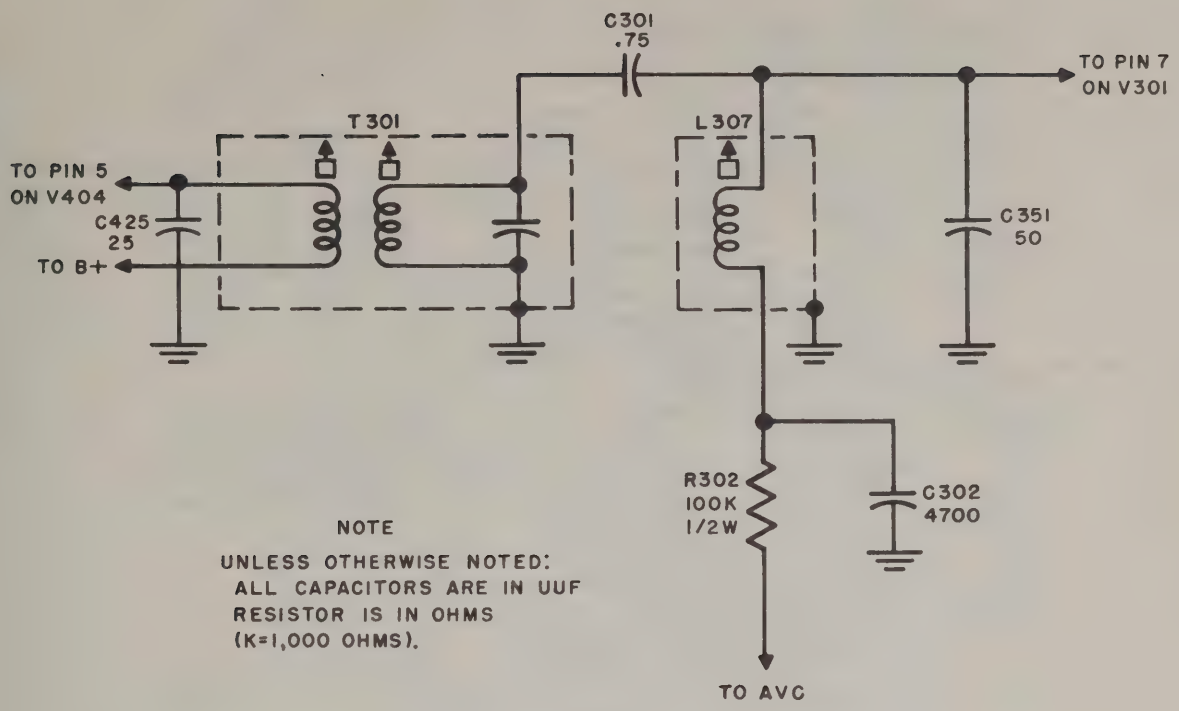


Figure 4-10. Radio Receiver R-361/GR, 40.4 MC Network, Simplified Schematic

the "1st AMPL PLATE" tuned circuit. C538 is the plate bypass capacitor. R510 is the plate decoupling resistor. L516 is the filament decoupling choke. C531 is the filament bypass capacitor. C533 and C511 are the B+ decoupling bypass capacitors. L510 is he plate decoupling choke.

4-14. SECOND TRIPLER (V503). (See figure 4-8.) C510 is the grid coupling capacitor. R511 and R512 are the grid bias resistors. The voltage developed across R511 is available for metering through jack J503, and is bypassed by C514. C537 is the filament bypass capacitor. C516 is the screen bypass capacitor. R513 is the screen dropping resistor. C515 is the plate bypass capacitor. L508 is the shunt feed inductance. R516 is the B+ decoupling resistor. L511 is the plate decoupling choke. C517 is the plate coupling capacitor to the "2nd TRIPL PLATE" tank U501.

4-15. SECOND AMPLIFIER (V504). (See figure 4-9.) C518 is the grid coupling capacitor. R514 and R515 are the grid bias resistors. The voltage developed across R514 is metered at the "2nd AMPL METER" jack J504 and is bypassed by capacitor C519. C539 is the filament bypass capacitor. R520 is the cathode bias resistor. C523 and C524 are cathode bypass capacitors. C525 is the screen bypass capacitor. R519 is the screen dropping resistor. L509 is the shunt feed inductance. C520 is the plate bypass capacitor. R518 is the plate decoupling resistor. C521 and C529 are the B+ bypass capacitors. L512 is the B+ decoupling inductance. C522 is the plate coupling to the "2nd AMPL PLATE" tank U502.

4-16. 40.4-MC NETWORK. (See figure 4-10.) This is a triple tuned network which serves as the coupling link between the first and second mixers. It is composed of first i-f transformer T301, a magnetically coupled double tuned transformer whose primary is tuned by C425, located in the r-f subassembly. The output of T301 is capacitively coupled to inductor L307 by capacitor C301. Capacitor C351 tunes L307 to 40.4 mc and serves as an r-f bypass capacitor for signals between 225 and 400 mc. An avc decoupling network is formed by resistor R302 and capacitor C302.

4-17. SECOND OSCILLATOR (V505). (See figure 4-11.) L513 and L515 are filament decoupling chokes. C530 and C536 are filament bypass capacitors. R524 and R525 are cathode bias resistors. Y502 is the 34.4 mc crystal. L506 is the neutralizing inductance used to resonate with crystal holder capacity at 34.4 mc. R521 is the grid leak resistor. C526 and C535 are the B+ decoupling capacitors. R517, R522 and R523 are the B+ decoupling resistors. C527 is the plate bypass capacitor. C534, C528 and L504 are elements of the "2nd OSC TUNING" tank. E501 is a parasitic suppressor. C504 is the grid coupling capacitor. L507 is used to attenuate harmonics of the 34.4 mc signal.

4-18. SECOND MIXER. (See figure 4-12.) L304 is the filament choke. C304 is the filament bypass

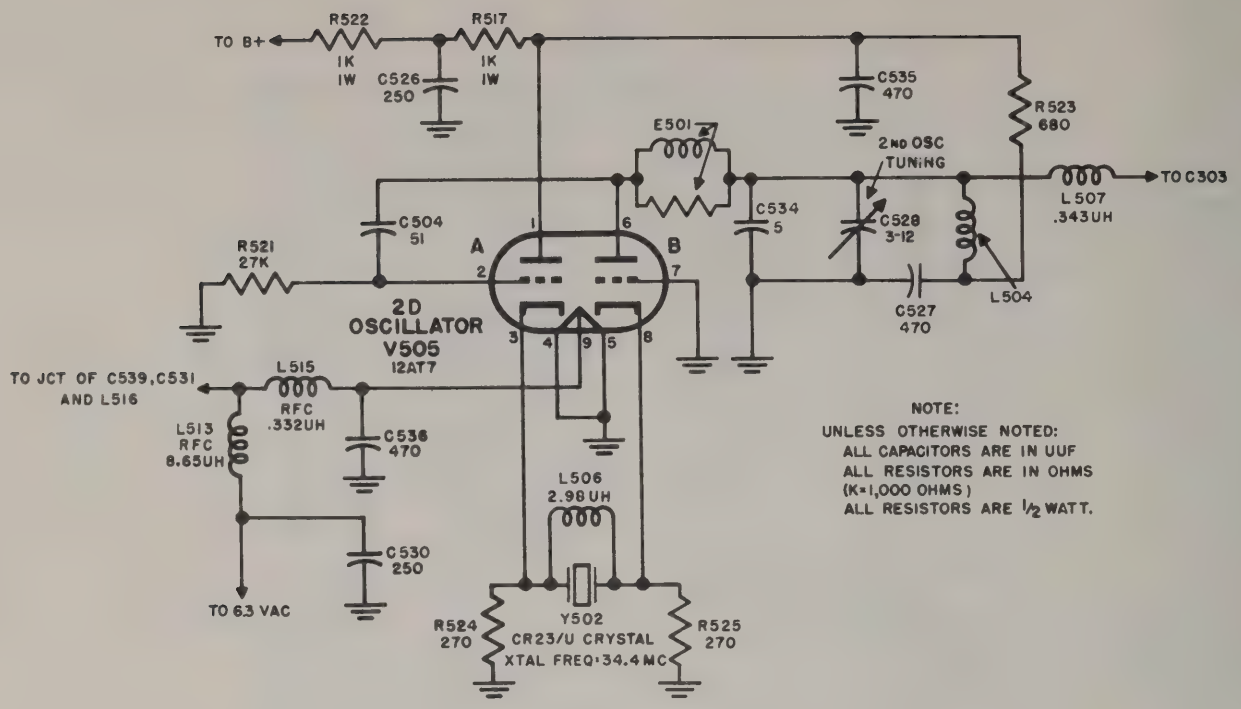


Figure 4-11. Radio Receiver R-361/GR, Second Oscillator, Simplified Schematic

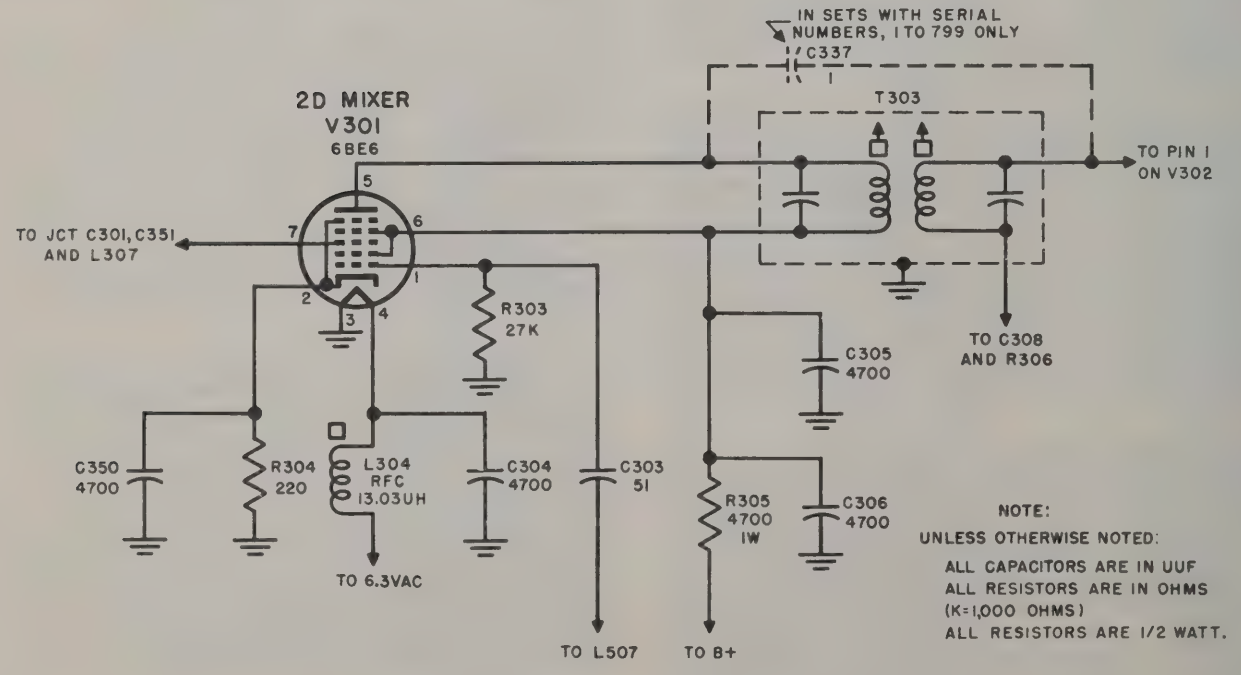


Figure 4-12. Radio Receiver R-361/GR, Second Mixer, Simplified Schematic

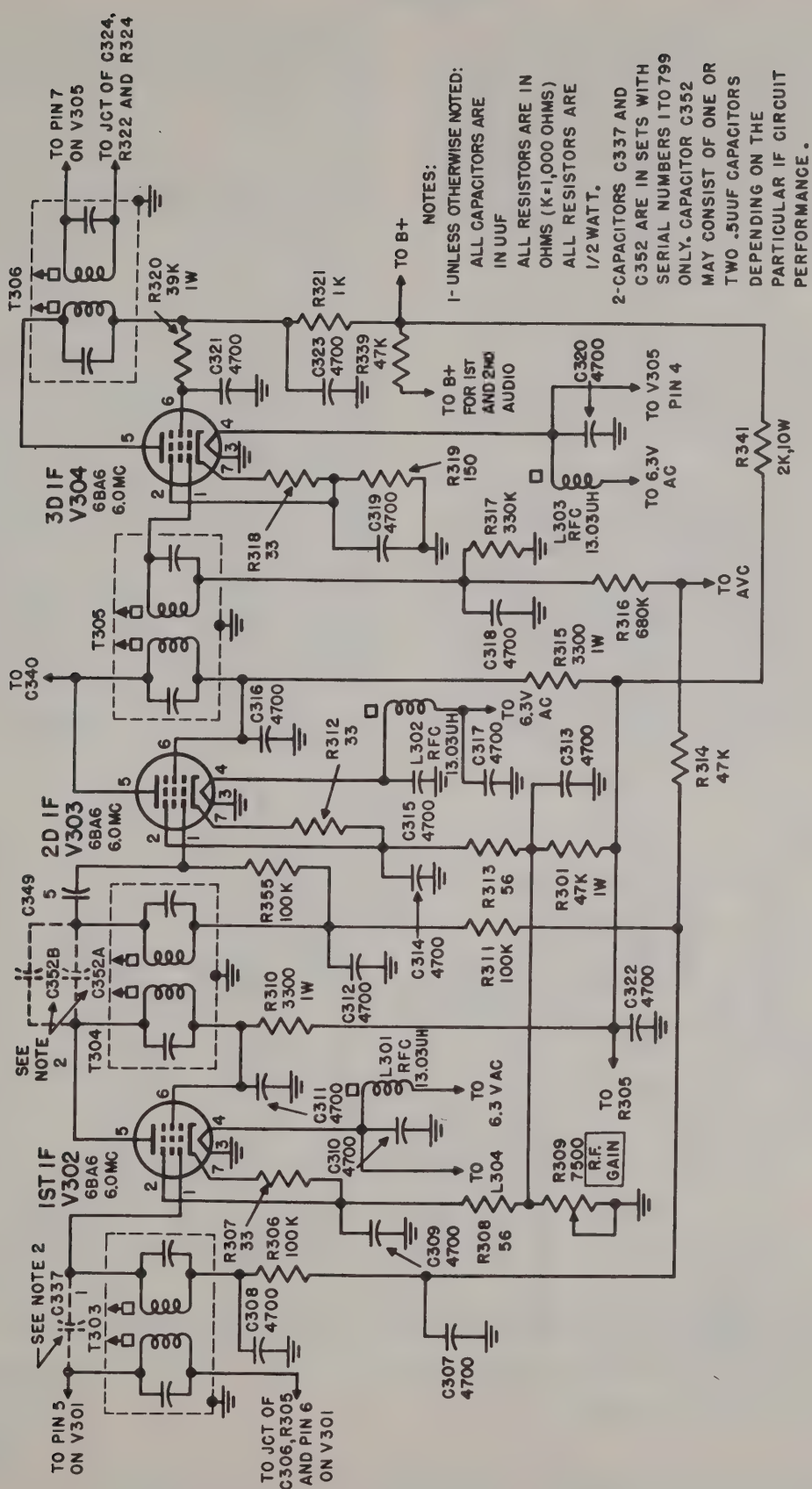


Figure 4-13. Radio Receiver R-361/GR, 6-MC I-F Section, Simplified Schematic

capacitor. R304 is the cathode bias resistor which is bypassed by capacitor C350. Capacitor C303 serves as coupling between the second oscillator and second mixer. R303 is the grid bias resistor. C305 and C306 are the screen and plate bypass capacitors. R305 is the plate decoupling resistor. The plate load of V301 consists of i-f transformer T303. The energy from the second mixer stage is transferred to the first 6-mc i-f stage by magnetic coupling in T303. For detailed assembly of T303 see figure 7-13.

NOTE

In receivers with serial numbers under 800, T303 is bridged by capacitor C337.

4-19. SIX-MC I-F SECTION. (See figure 4-13.) The 6-mc i-f section consists of three stages of amplification. See paragraphs 4-29 through 4-31.

4-20. FIRST 6-MC I-F AMPLIFIER. T303 is the coupling between the second mixer and the first i-f amplifier V302 with the primary and secondary tuned to 6 mc. (See paragraph 4-27.) C307 and C308 are avc bypass capacitors. R306 is the avc decoupling resistor. R307 is an unbypassed cathode resistor and supplies cathode degeneration. R308 is the cathode bias resistor. C309 and C313 are the cathode bypass capacitors. R309 is the "R.F. GAIN" control resistor. R301 is the B+ bleeder for the "R.F. GAIN" control. L301 is the filament decoupling choke. C310 is the filament bypass capacitor. C311 is the plate and screen bypass capacitor. R310 is the plate decoupling resistor. T304 is the coupling between the first and second i-f with primary and secondary tuned to 6 mc. For detailed assembly of T304 see figure 7-14.

NOTE

In receivers with serial numbers under 800, T304 is bridged by capacitor C352, which consists of one or two capacitors, depending on the particular i-f amplifier performance.

4-21. SECOND 6-MC I-F AMPLIFIER. C349 is the coupling capacitor between T304 and the second i-f amplifier tube V303. R355 is the grid return resistor. C312 is an avc bypass capacitor. R311 and R314 are avc bias decoupling resistors. C316 is the plate and screen bypass capacitor. R315 is the B+ decoupling resistor. R312 is an unbypassed cathode resistor and serves for cathode degeneration. R313 is the cathode bias resistor. C314 is the cathode bypass capacitor. L302 is the filament decoupling choke. C315 and C317 are the filament bypass capacitors. R341 is the B+ voltage dropping and decoupling resistor for the first and second i-f stages. C322 is the B+ decoupling capacitor. T305 is an i-f transformer and functions as the coupling between the second i-f stage and the third i-f stage, with the primary and secondary tuned to 6 mc. For detail assembly of T305 see figure 7-14.

4-22. THIRD 6-MC I-F AMPLIFIER. C318 is the avc bypass capacitor. R317 is an avc voltage divider

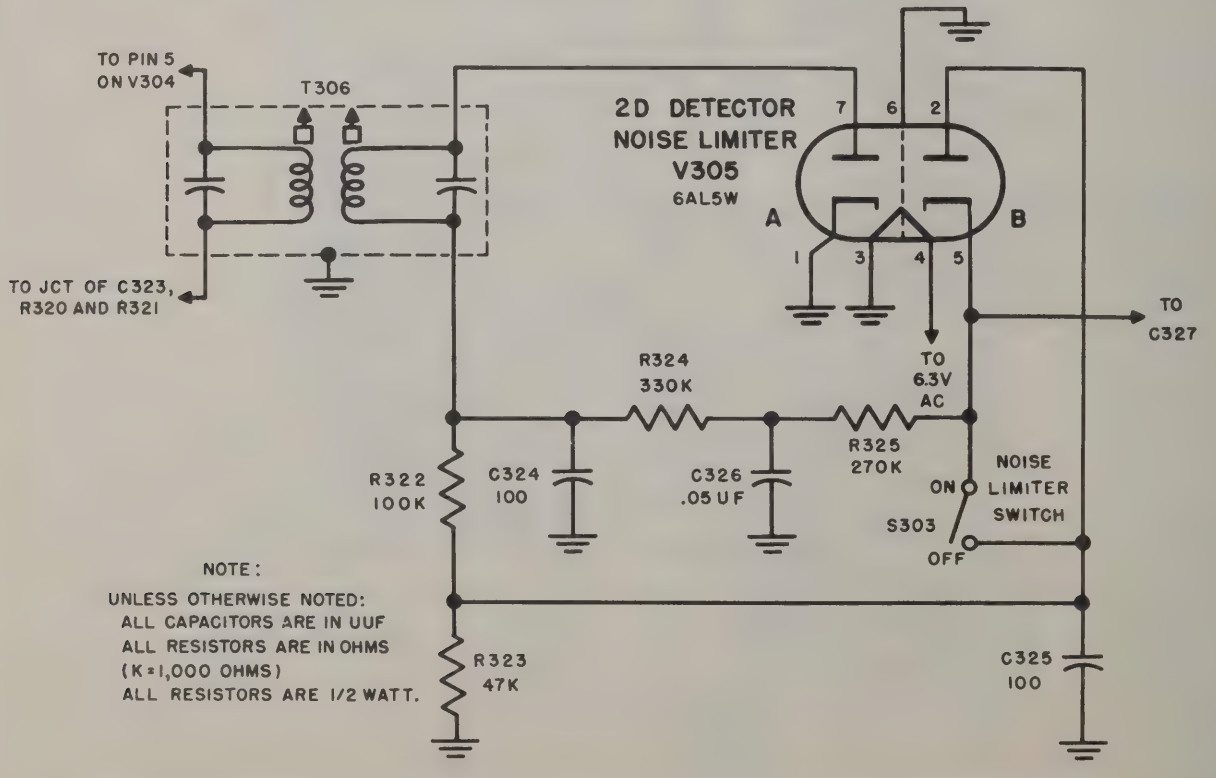


Figure 4-14. Receiver R-361/GR, Second Detector and Noise Limiter, Simplified Schematic

to provide the correct bias to the third i-f amplifier tube V304. R316 is the bias decoupling resistor. Resistor R318 is used for cathode degeneration. R319 is the cathode bias resistor. C319 is the cathode bypass capacitor. L303 is the filament decoupling choke. C320 is the filament bypass capacitor. C321 is the screen bypass capacitor. R320 is a screen dropping resistor. R321 and C323 comprise a plate decoupling circuit. R339 serves as a B+ voltage dropping and decoupling resistor for the audio stages. T306 is the coupling between the third i-f stage and the second detector stage, with the primary and secondary tuned to 6 mc. For detailed assembly of T306 see figure 7-14.

4-23. SECOND DETECTOR (V305A) AND NOISE LIMITER (V305B). (See figure 4-14.) Section "A" of dual-diode tube V305 operates as a detector. T306 is a coupling transformer between the third i-f and second detector stages. R322 and R323 are detector load resistors. C324 and C325 are second detector r-f bypass capacitors. R324, R325 and C326 comprise a time lag circuit that keeps the cathode of noise limiter tube V305B at a constant negative potential.

4-24. FIRST AUDIO AMPLIFIER AND SQUELCH CIRCUITS. The first audio amplifier uses half of V306. The squelch circuits are built around the squelch quieting tube, the other half of V306, the squelch amplifier tube, which uses half of V307, and the squelch diode, half of V308. See paragraphs 4-25 and 4-26.

4-25. FIRST AUDIO AMPLIFIER. (See figure 4-15.) C327 is the audio coupling capacitor between the second detector and the audio amplifier. R326 is the audio input voltage divider. R327 is the "A.F. GAIN" control. C328 is the coupling capacitor to the first audio amplifier grid. R330 is the cathode bias resistor. R331 serves as a cathode bias resistor for V306A, provides bias for squelch diode V308A, and, in conjunction with R340, serves as a voltage divider. C329 is a cathode bypass capacitor for V306A. R328 is the grid resistor for the first audio amplifier stage. R329 is a plate load resistor. C331A is the plate bypass capacitor for V306 and C330 the plate bypass for high audio frequencies.

4-26. SQUELCH CIRCUIT. (See figure 4-15.) R332 is a cathode bias resistor for V306B. R333 is the "AUDIO QUIETING DB" control. R337 is a plate load resistor for V307A. R338 is a grid-avc decoupling resistor and C334 is the bypass capacitor for the grid of the squelch amplifier. R340 is the voltage divider for the audio cut-off bias.

4-27. SECOND AUDIO AMPLIFIER (V307B) AND AUDIO POWER OUTPUT STAGES (V309). (See figure 4-16.) C332 is the grid coupling capacitor to V307B. R334 is the grid leak resistor for V307B. R335 is the cathode bias resistor. R336 is the plate load resistor. C335 is the coupling capacitor from the plate of V307B to the grid of V309. R344 is the grid leak resistor for V309. R345 is the cathode bias resistor. L306 and C356 are the components of an audio frequency tuned filter. C355 is an audio compensating

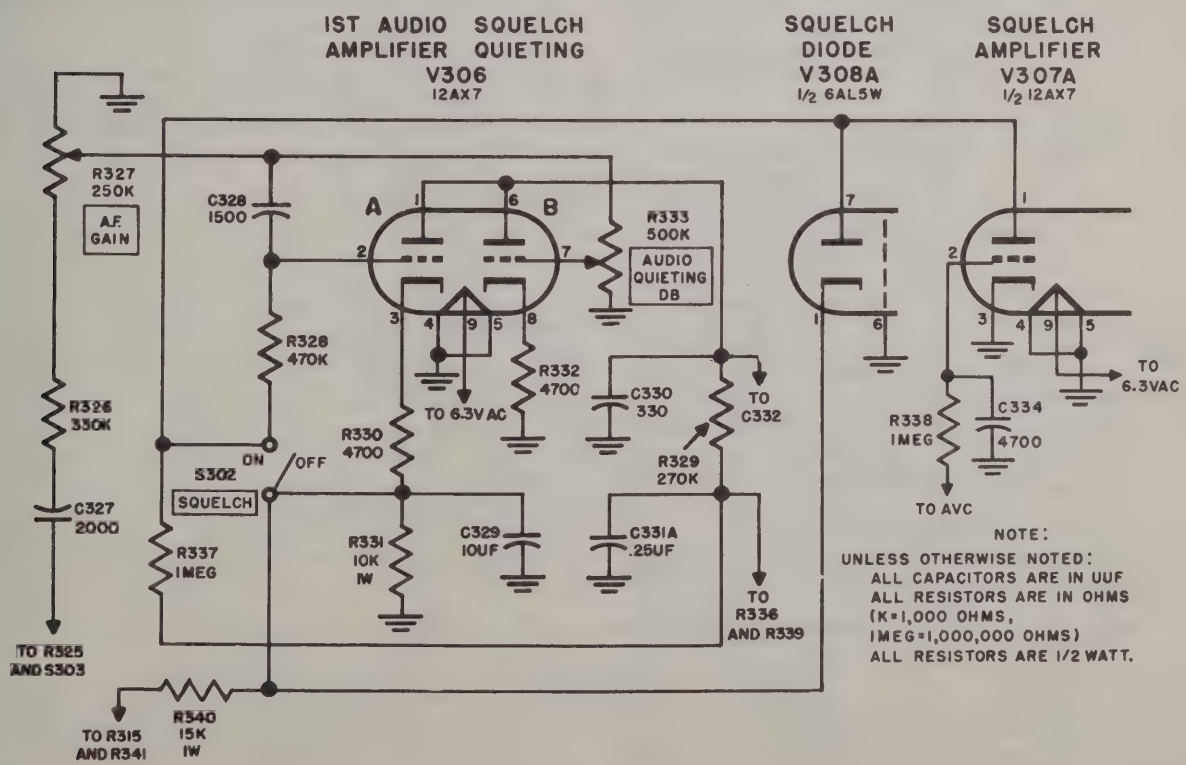


Figure 4-15. Radio Receiver R-361/GR, First Audio Amplifier and Squelch Circuits, Simplified Schematic

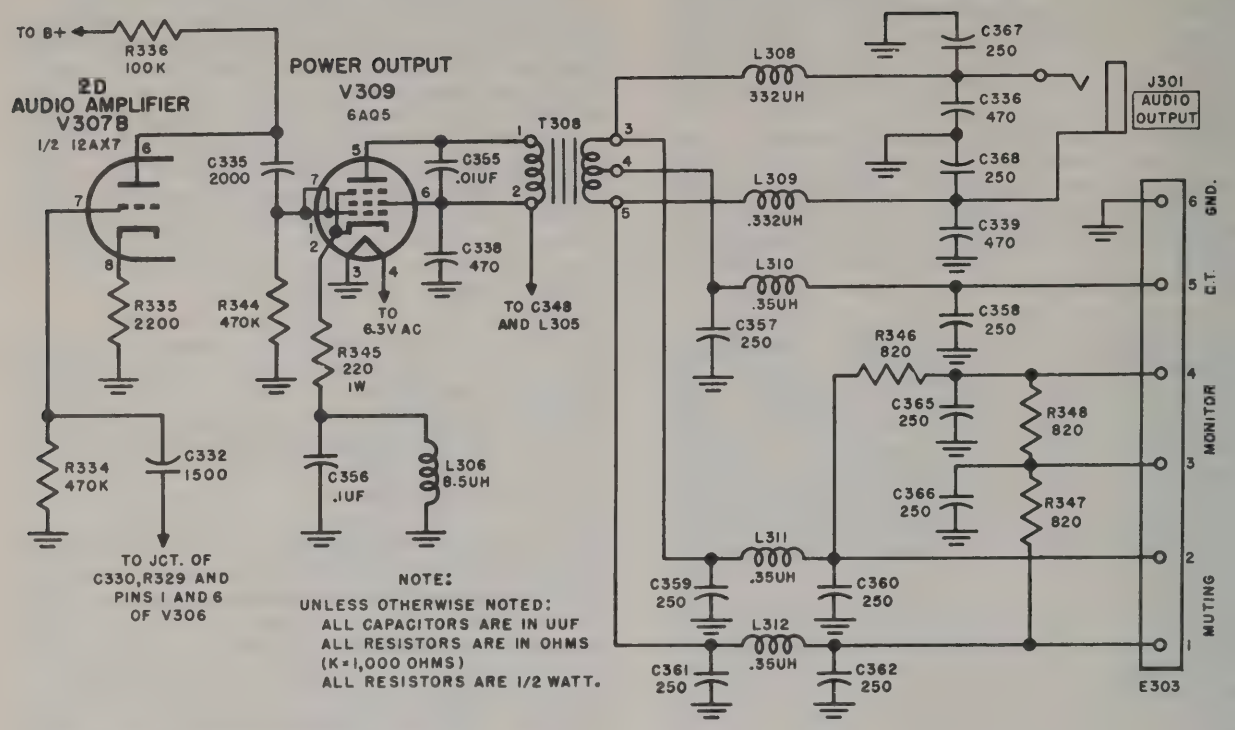


Figure 4-16. Radio Receiver R-361/GR, Second Audio Amplifier and Power Output Stages, Simplified Schematic

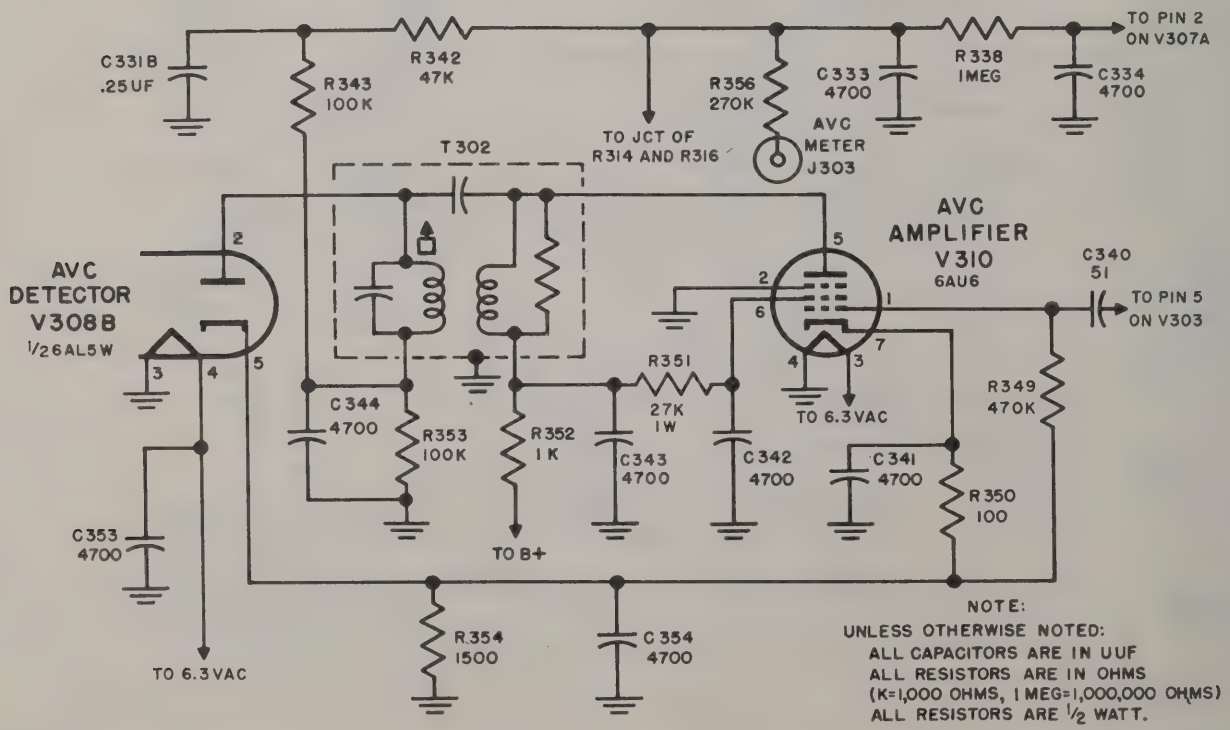


Figure 4-17. Radio Receiver R-361/GR, Automatic Volume Control, Simplified Schematic

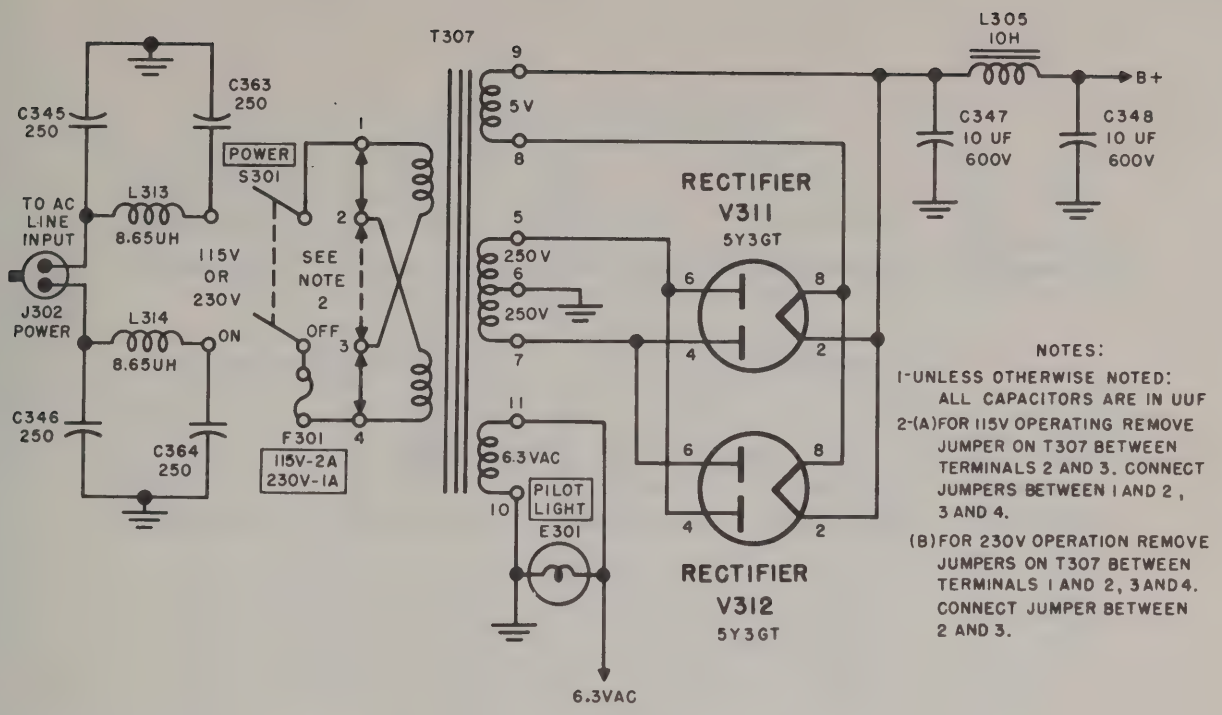


Figure 4-18. Radio Receiver R-361/GR, Power Supply, Simplified Schematic

bypass capacitor. C338 is a screen bypass capacitor. T308 is the output transformer. L308, L309, L310, L311 and L312 are r-f chokes. C336, C339, C357, C358, C359, C360, C361, C362, C365, C366, C367 and C368 are r-f bypass capacitors; R346, R347, and R348 audio attenuator resistors. R348 also serves as audio output resistor for the monitor circuit.

4-28. AUTOMATIC VOLUME CONTROL (V308B AND V310). (See figure 4-17.) C340 is the coupling from the second i-f plate to the grid of V310. R349 is the grid leak resistor for V310. R350 and R354 are cathode bias resistors. C354 is the r-f bypass capacitor across R354 and C341 is the cathode bypass for R350. R351 is the screen dropping resistor and C342 the screen bypass. C343 is the plate bypass and R352 the plate decoupling resistor. R353 is the avc detector load. C344 is the diode plate bypass capacitor. R338, R342 and R343 are avc filter resistors. C331B, C333 and C334 are avc filter capacitors. R356 is an avc test point isolation resistor. C353 serves as V308 filament bypass capacitor. T302 is the coupling between the avc amplifier and the avc detector, tuned to 6 mc. For detailed assembly of T302 see figure 7-12.

4-29. POWER SUPPLY (V311 AND V312). (See figure 4-18.) C345, C346, C363 and C364 are r-f bypass capacitors. L313 and L314 are r-f chokes. T307 is a power transformer. C347 and C348 are the filter capacitors. L305 is a filter choke.

4-30. DETAILED DESCRIPTION OF SYSTEMS OPERATION.

4-31. A detailed description of the operation of Radio Receiver R-361/GR is given below. Each section, comprising this equipment, will be fully discussed. (See figure 4-19.)

4-32. OSCILLATOR-MULTIPLIER CHAIN. The oscillator-multiplier chain is composed of the five following stages:

1. First oscillator and first tripler, V501.
2. First amplifier, V502.
3. Second tripler, V503.
4. Second amplifier, V504.
5. Second oscillator, V505.

4-33. FIRST OSCILLATOR AND FIRST TRIPLER (V501). (See figure 4-20.) The first oscillator is a Butler type circuit. Fundamentally it consists of a two-stage amplifier with sufficient positive feedback, from the cathode of the second to the cathode of the first amplifier, to sustain oscillation.

4-34. To understand the operation of this oscillator, imagine a random positive pulse at the cathode of the grounded grid amplifier V501A. Because the grid is grounded, a rise in cathode voltage will cause a decrease in plate current, therefore increasing the plate voltage. The positive pulse is then coupled to the grid of V501B. Since the cathode voltage follows the grid voltage, i.e., they are in phase, the positive pulse is coupled back to the cathode of the grounded grid amplifier, through the series mode crystal Y501. At series resonance, this crystal is a low impedance path of less than 40 ohms. The plate load of the

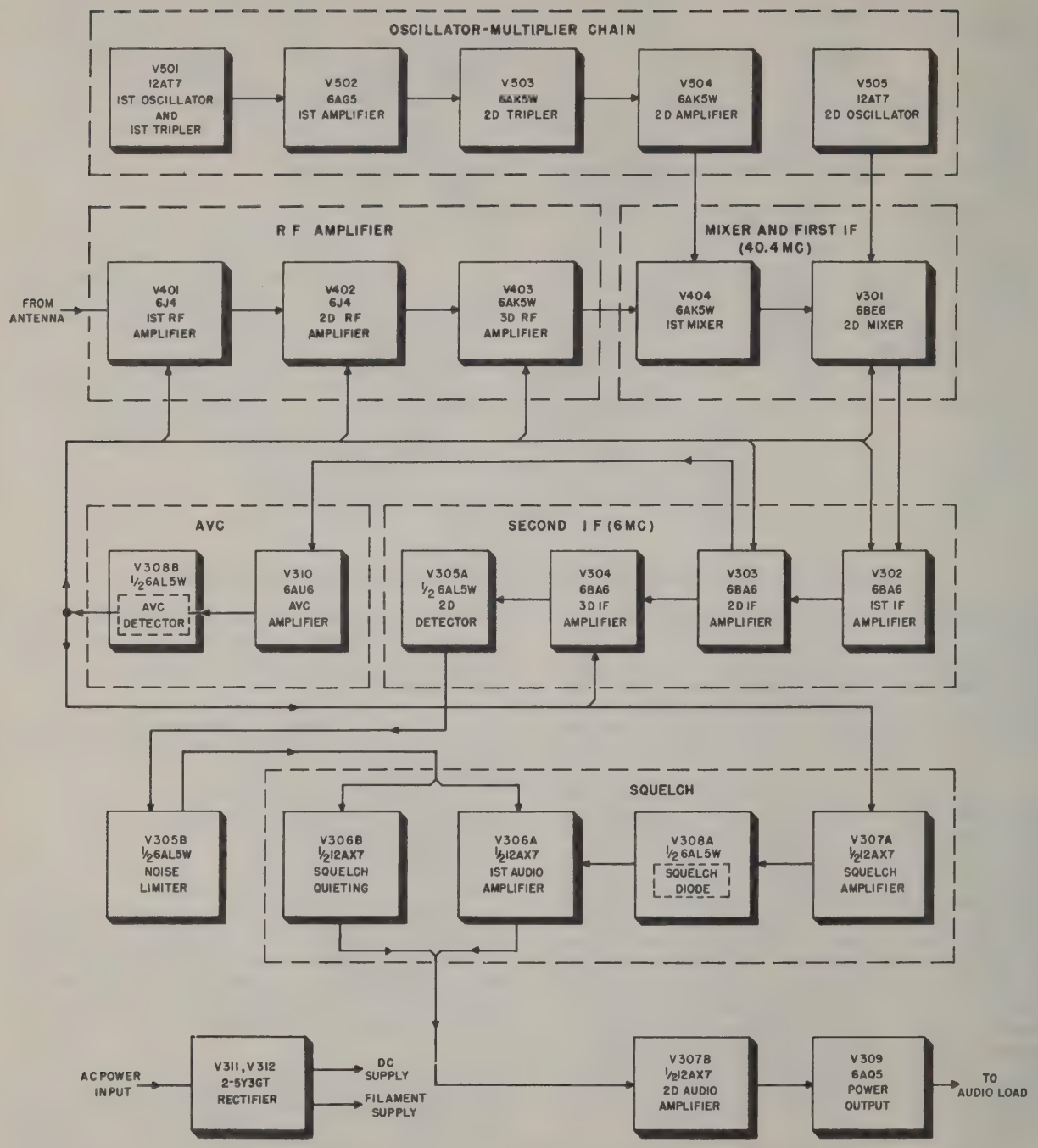

OSCILLATOR-MULTIPLIER CHAIN
V501 12AT7 IST OSCILLATOR AND IST TRIPLER
V502 6AG5 IST AMPLIFIER
V503 I5AK5W 2D TRIPLER
V504 6AK5W 2D AMPLIFIER
V505 12AT7 2D OSCILLATOR
R F AMPLIFIER
MIXER AND FIRST IF (40.4 MC)
FROM ANTENNA
V401 6J4 IST RF AMPLIFIER
V402 6J4 2D RF AMPLIFIER
V403 6AK5W 3D RF AMPLIFIER
V404 6AK5W IST MIXER
V301 6BE6 2D MIXER
AVC
SECOND I F (6MC)
V308B 1/2 6AL5W AVC DETECTOR
V310 6AU6 AVC AMPLIFIER
V305A 1/2 6AL5W 2D DETECTOR
V304 6BA6 3D IF AMPLIFIER
V303 6BA6 2D IF AMPLIFIER
V302 6BA6 IST IF AMPLIFIER
SQUELCH
V305B 1/2 6AL5W NOISE LIMITER
V306B 1/2 12AX7 SQUELCH QUIETING
V306A 1/2 12AX7 IST AUDIO AMPLIFIER
V308A 1/2 6AL5W SQUELCH DIODE
V307A 1/2 12AX7 SQUELCH AMPLIFIER
AC POWER INPUT
V311, V312 2-5Y3GT RECTIFIER
DC SUPPLY
FILAMENT SUPPLY
V307B 1/2 12AX7 2D AUDIO AMPLIFIER
V309 6AQ5 POWER OUTPUT
TO AUDIO LOAD

Figure 4-19. Radio Receiver R-361/GR, Functional Systems Block Diagram

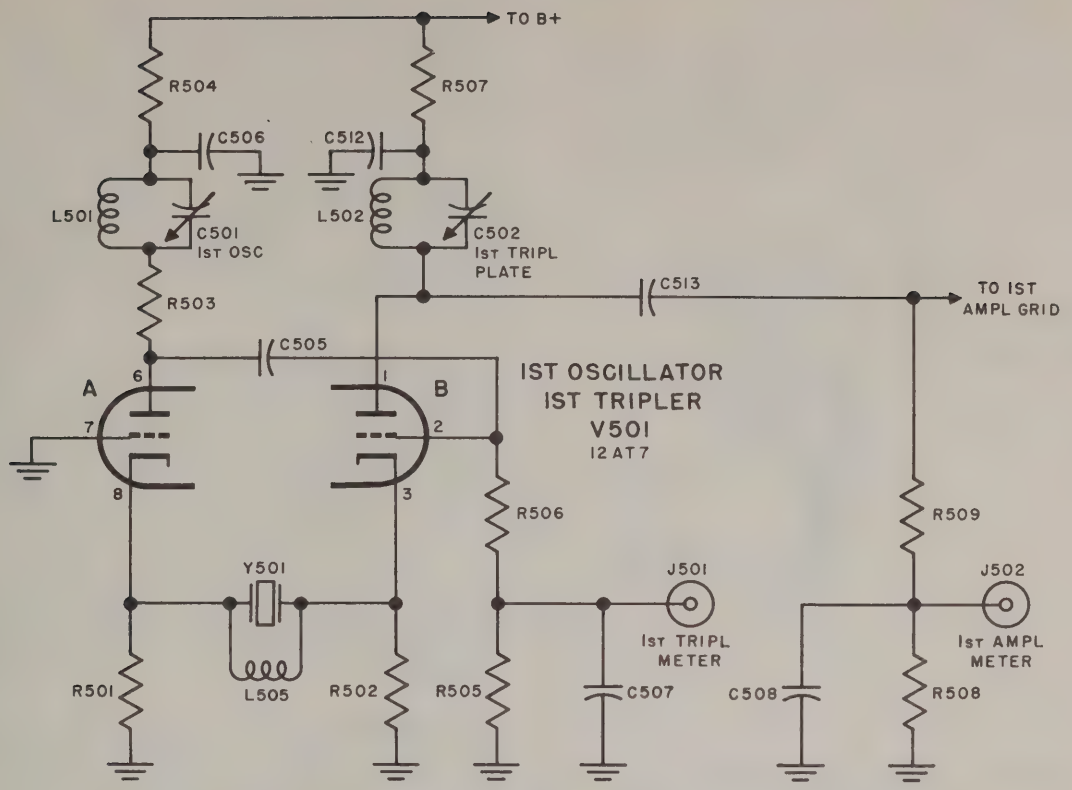


Figure 4-20. Radio Receiver R-361/GR, First Oscillator and First Tripler Circuit, Simplified Schematic

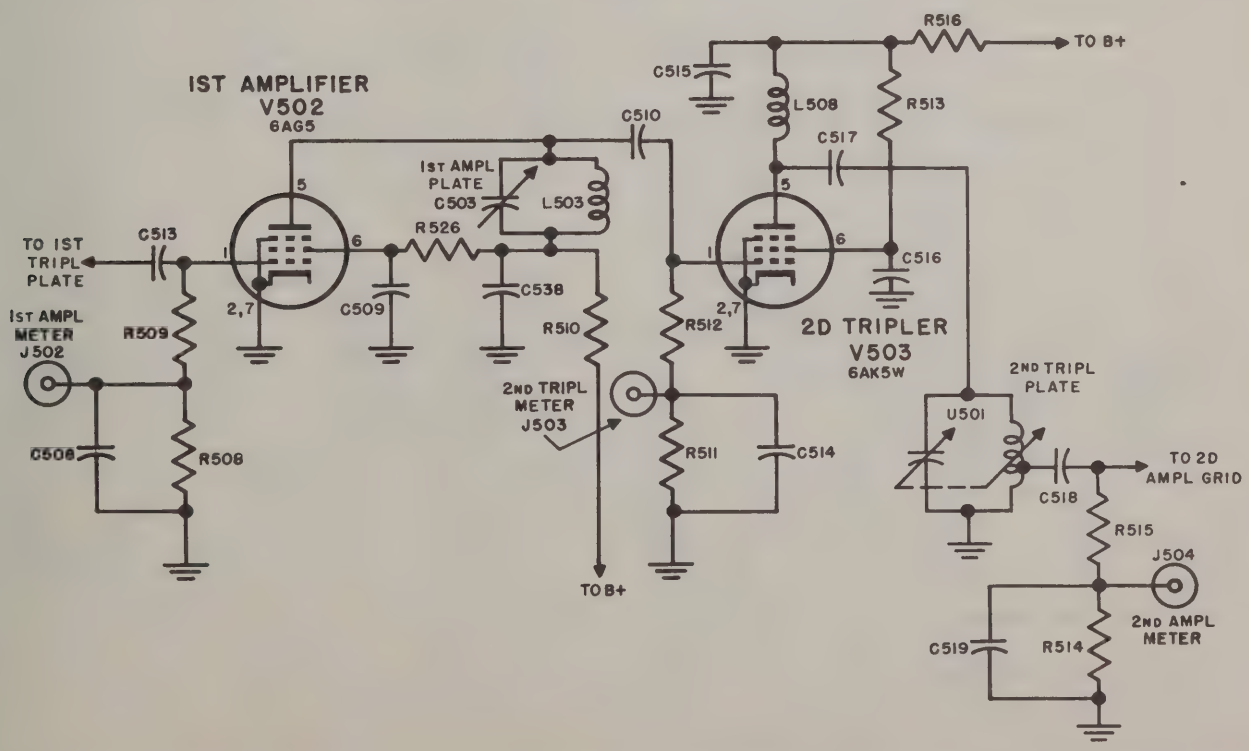


Figure 4-21. Radio Receiver R-361/GR, First Amplifier and Second Tripler Circuit, Simplified Schematic

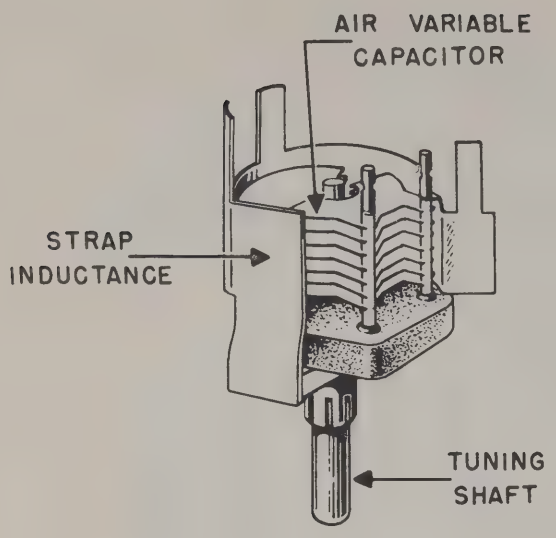


Figure 4-22. Radio Receiver R-361/GR, R-F Tuning Unit

grounded grid amplifier is tuned to the crystal frequency while the plate load of the output (tripler) amplifier is tuned to three times the crystal frequency. Oscillations are maintained since the feedback from the second to the first amplifier is sufficient to overcome losses. Note that one section of the dual triode tube V501 is designated as an oscillator. It is identified on the figure as "A". Actually, both sections of V501 are required in the operation of the oscillator. However, since the resonant frequency of the plate load of the "A" section is that of the crystal while that of the "B" section is three times that of the crystal, the "B" section is called the tripler.

4-35. If crystal Y501 fails the capacity of its holder offers a low impedance path between the cathodes of the two amplifiers that comprise the 1st oscillator 1st tripler stage. To overcome the likelihood of the circuit going into oscillation, inductor L505 is connected in parallel with Y501. The resultant parallel resonant circuit has sufficiently high impedance to effectively open the cathode feedback circuit.

4-36. FIRST AMPLIFIER (V502). (See figure 4-21.) The first amplifier is a Class C power amplifier, used to provide enough drive for the 2nd tripler. The plate circuit is tuned to three times the oscillator frequency.

4-37. SECOND TRIPLER (V503). (See figure 4-21.) The second tripler is a Class C amplifier used as a frequency multiplier. The tuned plate circuit, U501, is tuned to nine times the crystal frequency. U501

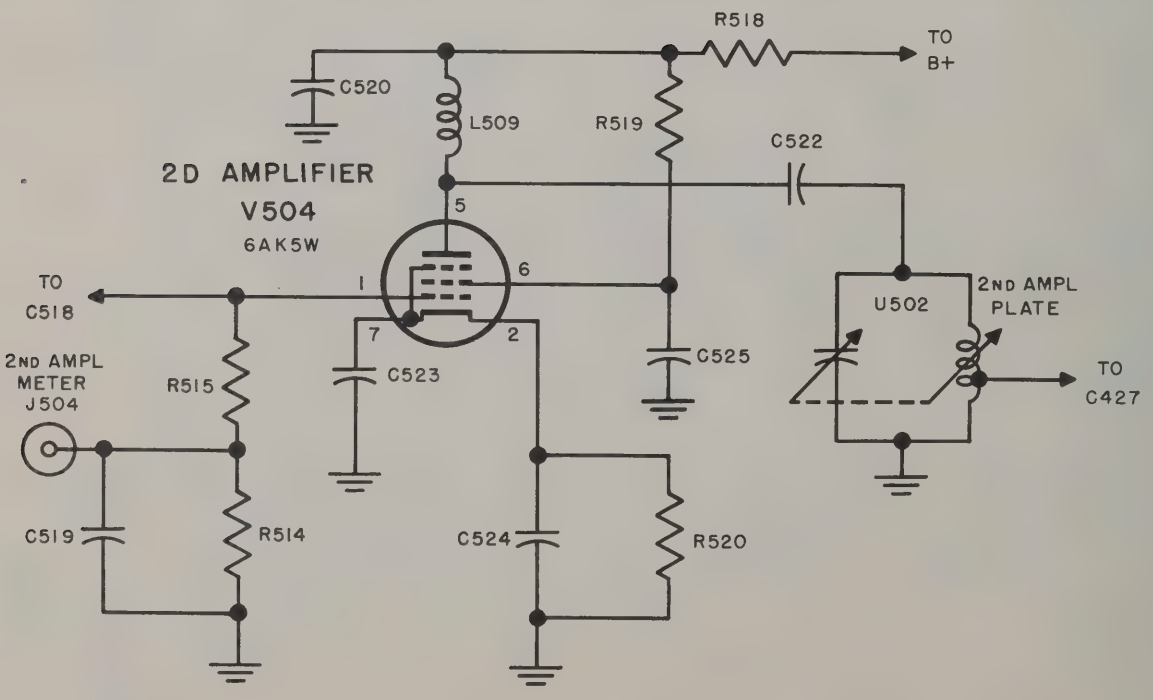


Figure 4-23. Radio Receiver R-361/GR, Second Amplifier, Simplified Schematic

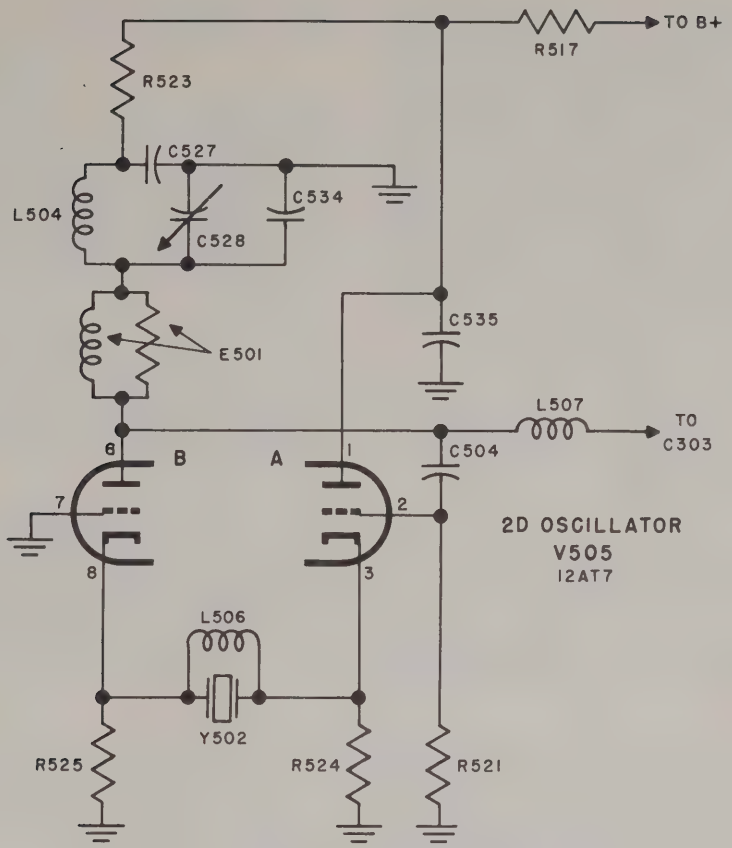


Figure 4-24. Radio Receiver R-361/GR, Second Oscillator, Simplified Schematic

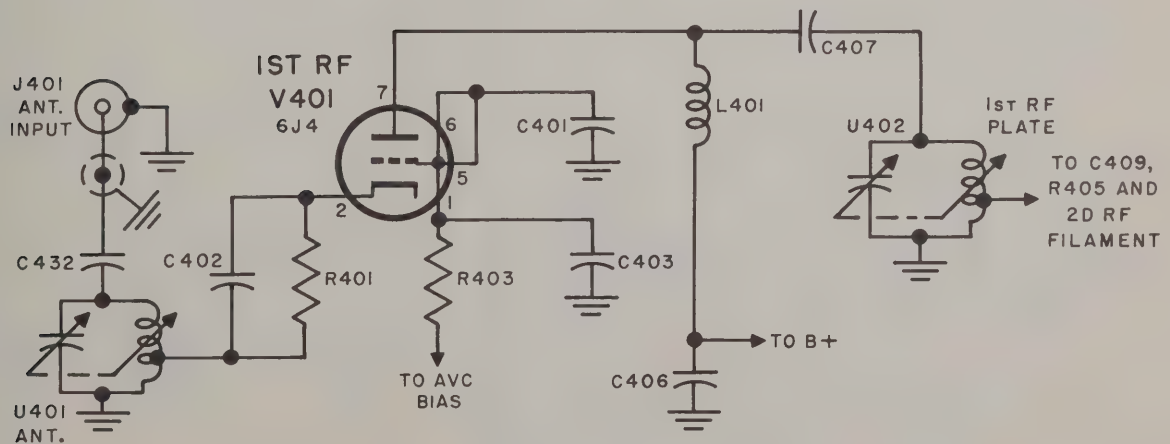


Figure 4-25. Radio Receiver R-361/GR, Grounded Grid R-F Amplifier, Simplified Schematic

(see figure 4-22) consists of a strap inductance mechanically and electrically attached to an air variable capacitor. The tuning action is as follows: When the capacitor is completely closed, there is maximum capacity and inductance. Therefore, the second tripler is tuned to the lowest frequency. As the rotor is opened the capacity decreases, and the rotor begins to fill the space within the inductor strap. This has the same effect as tuning a coil with a brass slug, that is, it decreases the inductance. It will be noted, that this element is essentially a variable capacitor connected in parallel with and ganged to a variable inductor. This combined action results in a greater tuning range than would be available from the change in tuning capacity only.

4-38. SECOND AMPLIFIER (V504). (See figure 4-23.) The second amplifier is a Class C power amplifier used to provide the required drive to operate the first mixer efficiently. The plate tank circuit is tuned to nine times the crystal frequency.

4-39. SECOND OSCILLATOR (V505). (See figure 4-24.) The second oscillator is a Butler type circuit, explained in detail in paragraph 4-33. This oscillator differs from the first oscillator in this respect. The plate load of the grounded grid amplifier is a tuned circuit, resonant at 34.4 mc. The other amplifier is a cathode follower as the plate is at r-f ground potential.

4-40. FIRST R-F AMPLIFIER (V401) AND SECOND R-F AMPLIFIER (V402). (See figure 4-25.) The first and second r-f amplifiers are grounded grid triodes. The antenna circuit input impedance of U401 is approximately 50 ohms, over the frequency range.

4-41. THIRD R-F AMPLIFIER (V403). (See figure 4-26.) V403 is a shunt fed r-f amplifier. Amplification in this stage has been reduced, to remove all traces of regeneration, by tapping down the tank circuit U403 of the previous stage and by placing a loading resistor, R420, across the output tank circuit U404.

4-42. FIRST MIXER (V404) AND FIRST I-F NETWORK. (See figure 4-27.) The first mixer is a pentode with the r-f signal on the first grid, and the signal from the oscillator injected on the cathode. The oscillator signal frequency at this point is nine times the frequency of the first oscillator crystal Y501. The plate load is tuned to 40.4 mc (the difference between the first grid and oscillator frequencies).

4-43. The first i-f is a triple tuned network, consisting of transformer T301, capacitors C301, C351, and C425, and inductor L307. Because of the capacity of C301, the overall triple tuned network is just under critical coupling.

4-44. SECOND MIXER (V301). (See figure 4-28.) The second mixer is a pentagrid converter that is externally excited. The 40.4 mc signal is coupled to the third grid of V301. The 34.4-mc oscillator signal, from the second oscillator crystal Y502, is injected on the first grid, and the plate load tuned to 6 mc.

NOTE

Capacitor C337 is not used in receivers with serial numbers of 800 and up. This reduces adjacent channel interference by narrowing the bandwidth at 6 mc.

4-45. SECOND I-F (6-MC) SECTION. (See figure 4-29.) The 6-mc i-f circuits are conventional pentode amplifiers. Four slightly overcoupled, double-tuned i-f transformers provide a selectivity curve having a broad nose with comparatively sharp sides.

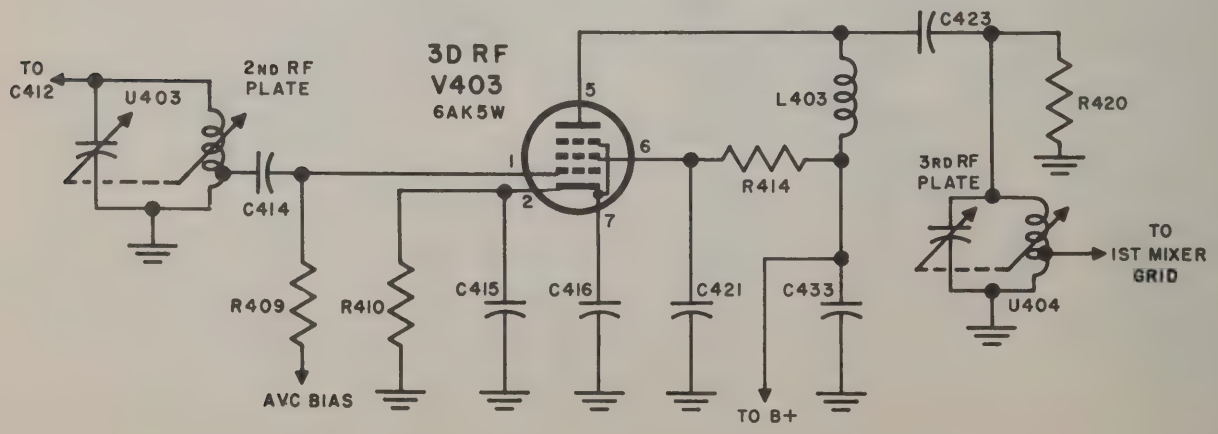


Figure 4-26. Radio Receiver R-361/GR, Third R-F Amplifier, Simplified Schematic

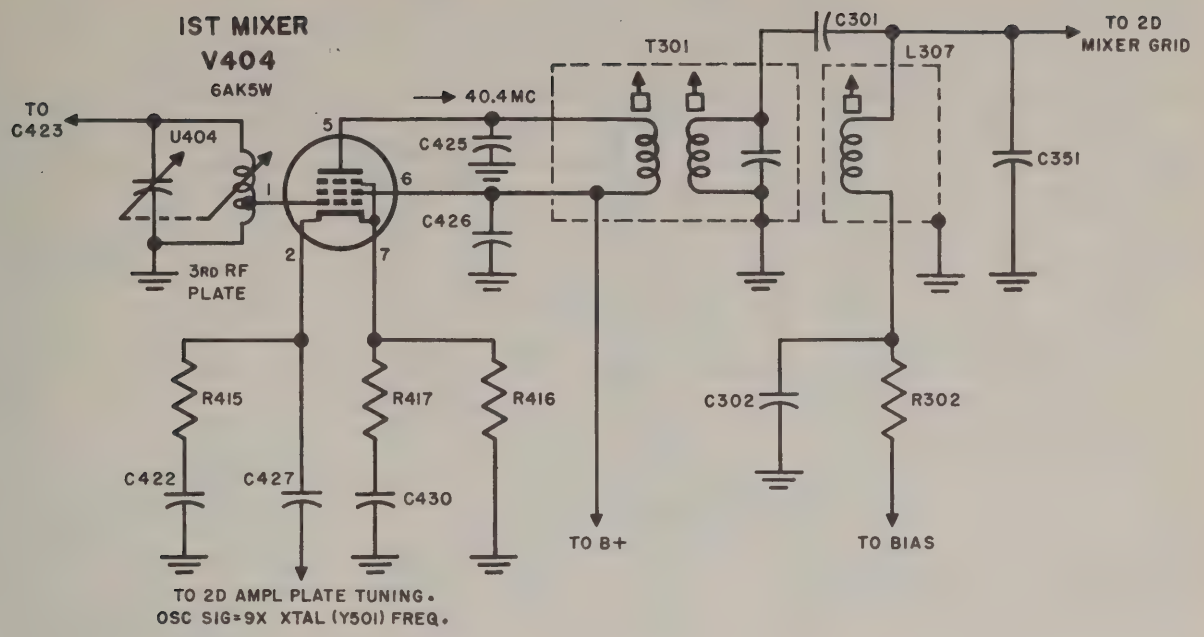


Figure 4-27. Radio Receiver R-361/GR, First Mixer and First IF, Simplified Schematic

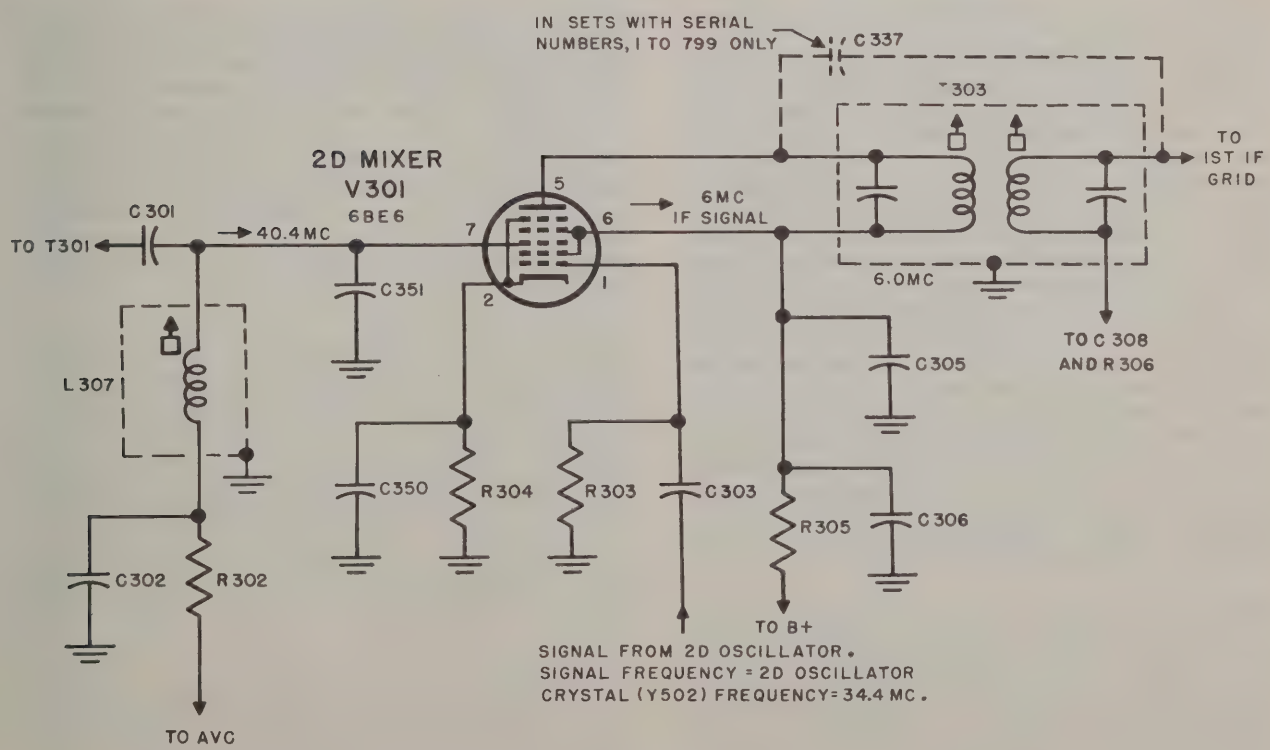


Figure 4-28. Radio Receiver R-361/GR, Second Mixer, Simplified Schematic

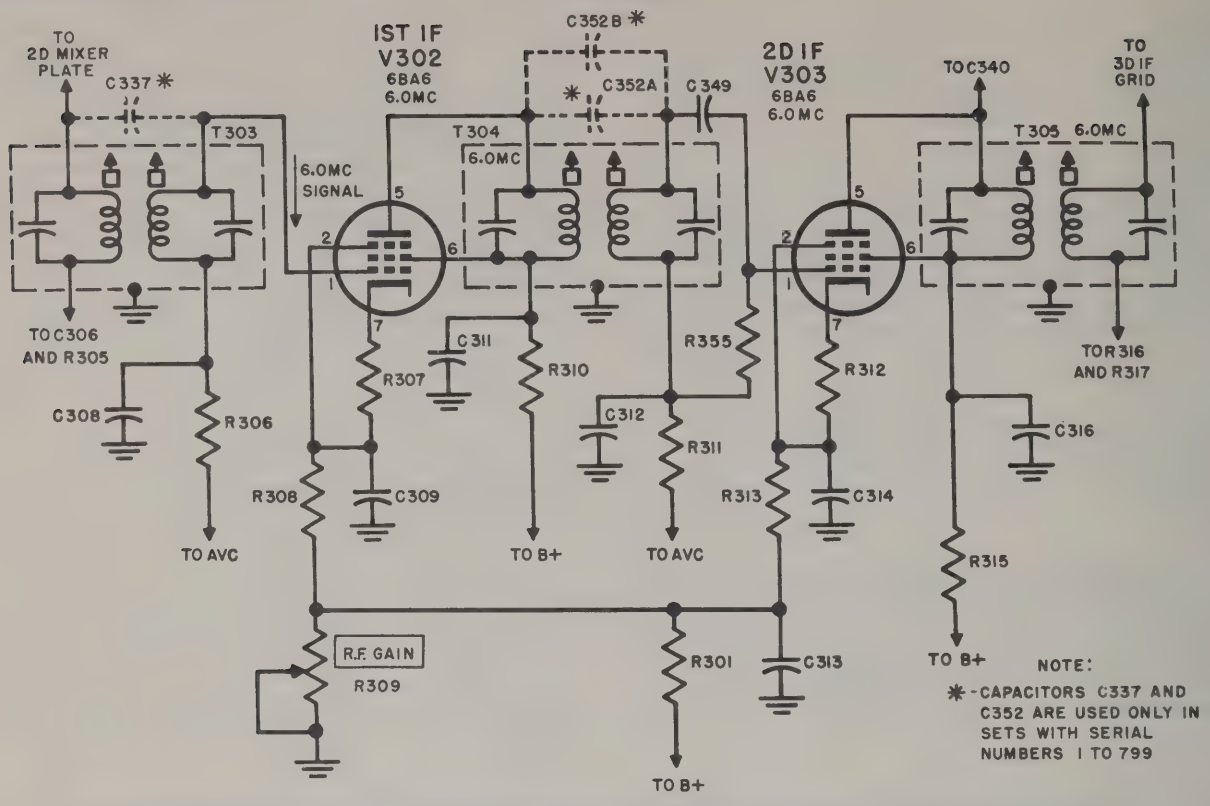


Figure 4-29. Radio Receiver R-361/GR, First and Second 6-MC IF, Simplified Schematic

NOTE

Capacitor C352 is not used in receivers with serial numbers of 800 and up. This reduces adjacent channel interference by narrowing the bandwidth of the 6-mc i-f section.

4-46. SECOND DETECTOR AND NOISE LIMITER (V305). (See figure 4-30.) One diode, V305A, operates in the usual form of second detector. The other diode, V305B, has its plate circuit connected across a portion of the second detector-diode-voltage divider and acts as a variable resistor in series with the audio output circuit. The audio is taken from the cathode of the noise limiting diode and as long as the noise pulses are of less amplitude than the audio frequency components of the desired signal the noise limiting diode functions like a closed switch and passes the audio on to the a-f section of the receiver. When the noise impulse exceeds the signal component, the noise limiting diode performs as an open switch, or high resistance, and prevents any signal or noise from passing through the audio amplifier.

4-47. The modulated r-f voltage appearing across the secondary of T306 is detected by V305A. R322 and R323 have been designed to represent the proper load while preventing the noise limiter from clipping below 80-percent modulation. Resistors R324 and R325 in conjunction with capacitor C326 comprise an R-C (resistance-capacitance) time delay circuit in the noise limiting diode cathode circuit that tends to maintain this cathode at a fairly constant negative potential. As the signal voltage becomes positive on V305A, a plate current will flow, making Point No. 1 negative with respect to Point No. 2. Audio voltage will appear between Point No. 1 and ground. Due to the function of the R-C network between Points 1 and 3, Point No. 3 will be at a negative potential which is essentially the same d-c potential as Point No. 1 before V305B starts conducting. As Point No. 2 assumes a more positive potential than Point No. 3, V305B will conduct. Since Point No. 2 has audio potential to ground, Point No. 3 will also have audio potential to ground.

4-48. A short noise pulse, even though of high amplitude, will not change the bias on the noise limiting diode due to the relatively long time constant of the R-C network in its cathode circuit. Hence, if a noise pulse greater than the d-c voltage between Points No. 1 and 2 appears at these points, the plate of V305B will become temporarily more negative than the cathode. This immediately makes the noise diode have a very high plate to cathode impedance which prevents the noise pulse from getting through to the audio amplifier. See figure 7-15 for the instantaneous waveforms.

4-49. SQUELCH CIRCUITS AND FIRST AUDIO AMPLIFIER. (See figure 4-31.) The purpose of the squelch circuit is to reduce the objectionable noise that occurs between periods of signal input. Automatic volume control action increases the sensitivity of the receiver when there is weak or no signal input

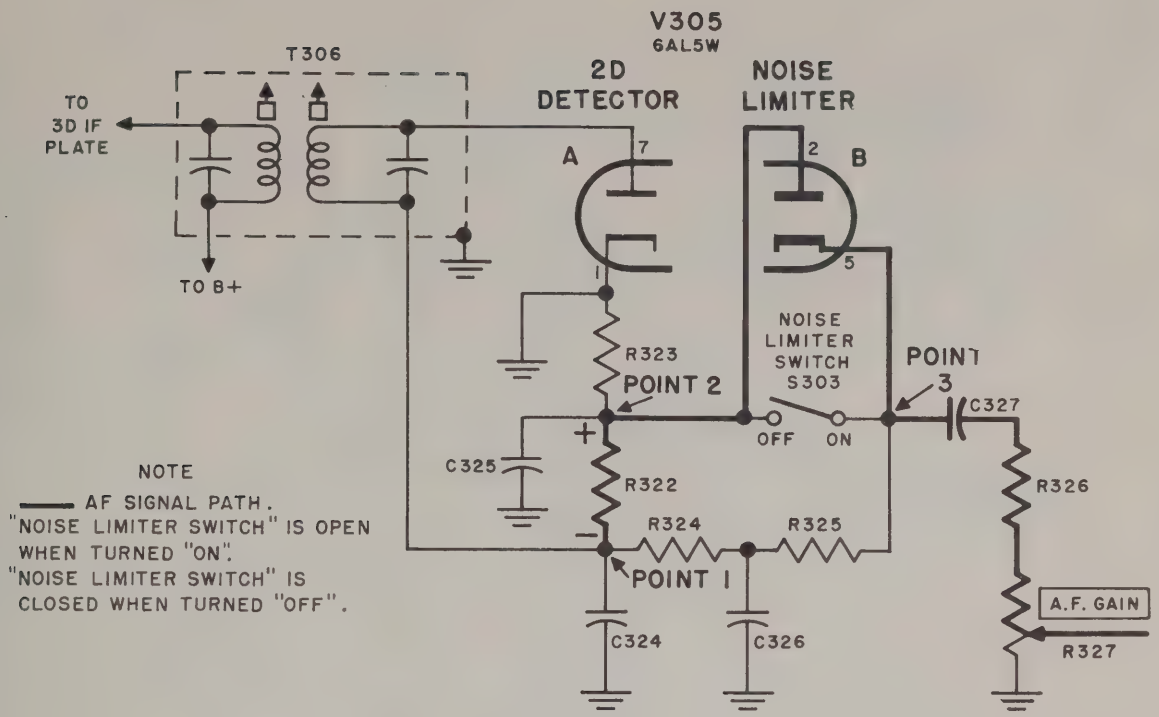


Figure 4-30. Radio Receiver R-361/GR, Second Detector and Noise Limiter, Simplified Schematic

and causes an objectionable hiss or roar in the loudspeaker if the audio volume control is turned up very high. The squelch circuit is designed to silence the audio frequency amplifier for all carrier signals below a certain pre-determined level.

4-50. A direct coupled amplifier and a diode are connected in the grid cathode circuit of the first audio amplifier in such a manner that it is biased beyond cutoff when, in the absence of an r-f signal input, no avc voltage is impressed on the grid of the direct coupled amplifier. When the r-f signal input is sufficient to set up a large enough value of avc voltage, the diode will conduct, acting like a switch, and permit the a-f amplifier bias to reduce to a value that permits normal audio output. The first audio amplifier is paralleled with an auxiliary amplifier whose audio input level can be adjusted so as to bypass incoming a-f signals around the first audio amplifier permitting reduced output while the first audio amplifier is "squelched."

4-51. The squelch circuit is in operation when switch S302 is open. With a weak or no signal input the avc voltage will not be sufficiently negative to cut-off the squelch amplifier (direct coupled amplifier) V307A. Resistor R337, in the grid circuit of the first audio amplifier V306A, is the plate load of the squelch amplifier V307A. Since the value of R337 is much greater than the plate resistance of V307A, a relatively strong plate current will cause a substantial voltage drop across R337 causing the plate of V307A to be at a low potential. At this time, Point No. 2 is at a more positive potential than Point No. 1, because of the B+ voltage fed through R340 and R341, hence the audio amplifier V306A is biased beyond cut-off by the voltage difference. When a stronger signal is received, the negative potential of the avc increases. The effect of this will be to bias the squelch amplifier V307A beyond cut-off, thus increasing its plate voltage due to less voltage drop across R337. Point No. 1 is now positive with respect to Point No. 2, causing V308A, connected between Point No. 1 and Point No. 2, to conduct. The bias on V306A is then determined by grid resistor R328 and cathode resistor R330. Resistor R330 is unbypassed to decrease audio distortion. The strength of signal needed to overcome the squelch, is determined by the setting of the "R.F. GAIN" control, which adjusts the amplification of the i-f strip. As the gain of the i-f strip is decreased, a larger signal is required at the antenna, to produce sufficient avc voltage to close the squelch. For example, if the "R.F. GAIN" control is set to make the receiver operate at 5-uv input signal, a weaker signal will be heard only if the "AUDIO QUIETING DB" control is set for the weaker signal.

4-52. SECOND AUDIO AMPLIFIER AND POWER OUTPUT STAGES. (See figure 4-32.) The output of V306 is fed to the second audio amplifier V307B for further amplification. The output of V307B is used to drive the power amplifier tube V309. This amplifier is required to supply adequate audio power to output transformer T308. The cathode and plate of this tube have separate tuned networks. These tuned networks enable the audio response above 1,000 cps to taper

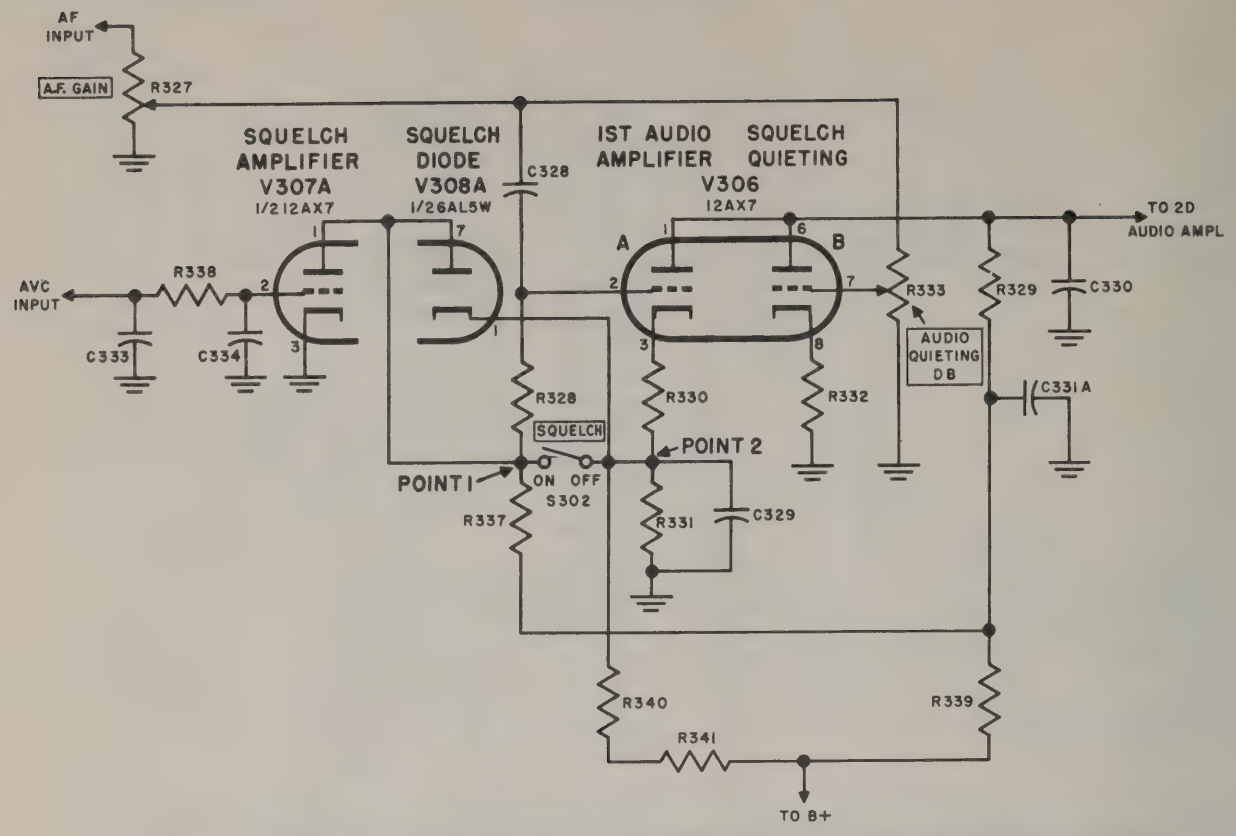


Figure 4-31. Radio Receiver R-361/GR, Squelch and First Audio Amplifier, Simplified Schematic

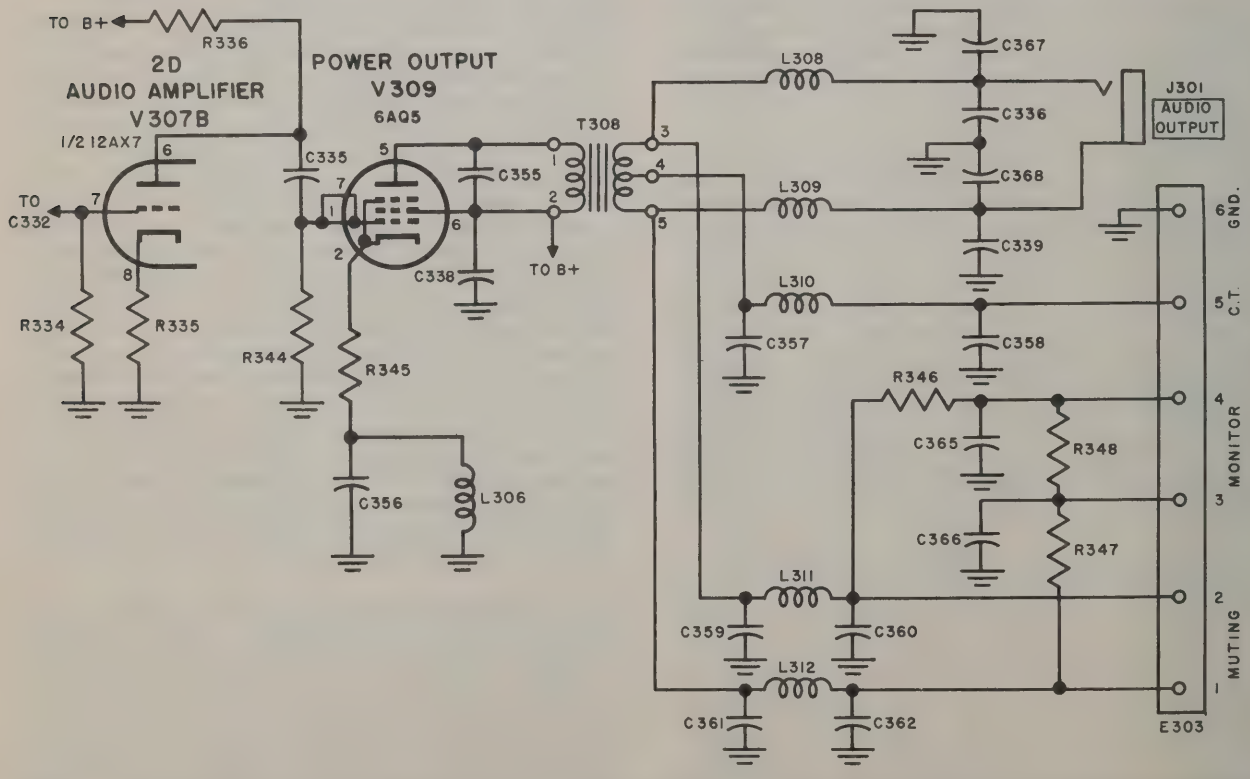


Figure 4-32. Radio Receiver R-361/GR, Second Audio Amplifier and Power Output Stages, Simplified Schematic

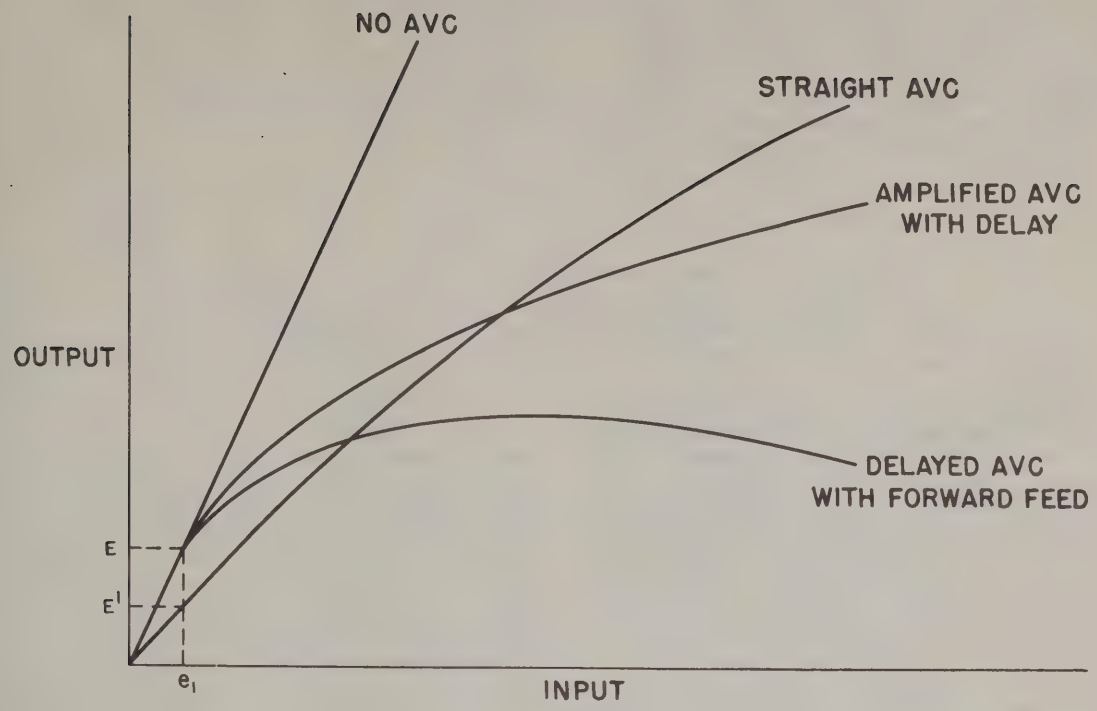


Figure 4-33. Radio Receiver R-361/GR, Automatic Volume Control Characteristics

off gradually. A pad consisting of R346, R347 and R348 supplies 15 dbm (15 decibels below one milliwatt) of power for a 600-ohm telephone line when the "A.F. GAIN" control is set to deliver one watt of audio power into a 600-ohm load connected at J301. The monitoring output is obtained between terminals No. 3 and 4 on terminal board E303. Terminals No. 1 and 2 are provided for a muting circuit. These terminals are in parallel with the "AUDIO OUTPUT" jack J301 and are connected across the secondary winding of T308. In some installations where receivers and transmitters are connected to operate on a common antenna system, the muting terminals are connected to a shorting relay in the transmitter. In the transmitting position, the antenna would be shifted to the transmitter and the muting terminals short circuited to prevent the receiver output from operating during transmission periods. The remaining terminals No. 5 and 6 on E303 are used to connect the center tap of the output winding on T308 to ground. By connecting a jumper between Points No. 5 and 6 the audio output across J301 is made to be balanced to ground.

4-53. AUTOMATIC VOLUME CONTROL (AVC). (See figures 4-33 and 4-34.) The function of the avc circuit is to permit maximum gain until a predetermined output level is reached, and then to reduce the gain with increasing signal so as to keep the level constant. In the R-361/GR receiver constant output level is maintained by using a delayed avc with a forward feed (figure 4-33).

4-54. With no avc, the output is proportional to the input limited only by some practical considerations such as the signal handling capabilities of tubes in the various stages of the receiver. With ordinary avc, the output is no longer proportional to the input; the avc goes into action as soon as a signal is received and the system can handle larger signals. An amplified avc is characterized by a more rigid control of the output, while delay in the operation of this avc permits a usable output at lower input voltages. For example, at an input of e_1 an avc without delay permits an output voltage E', while an avc with delay permits the larger output E.

4-55. If a portion of this avc voltage is fed to a stage following the avc take-off point, it is possible to have fairly constant output with variable input, and finally the output decrease with very strong input signals. In the receiver, the avc action may be followed by referring to figure 4-34.

4-56. Before a signal is applied (figure 4-34), V310 is conducting, making Point No. 1 positive with respect to ground while Point No. 2 is at ground potential. As a signal is supplied from the plate of the second i-f amplifier, it is amplified by V310 and fed to the avc detector V308B. When the positive amplitude on the plate of V308B is greater than the d-c voltage across R354, this tube will conduct. The voltage across R354 is the effective avc delay voltage for the circuit. When V308B is conducting, Point No. 3 becomes negative with respect to ground. This voltage

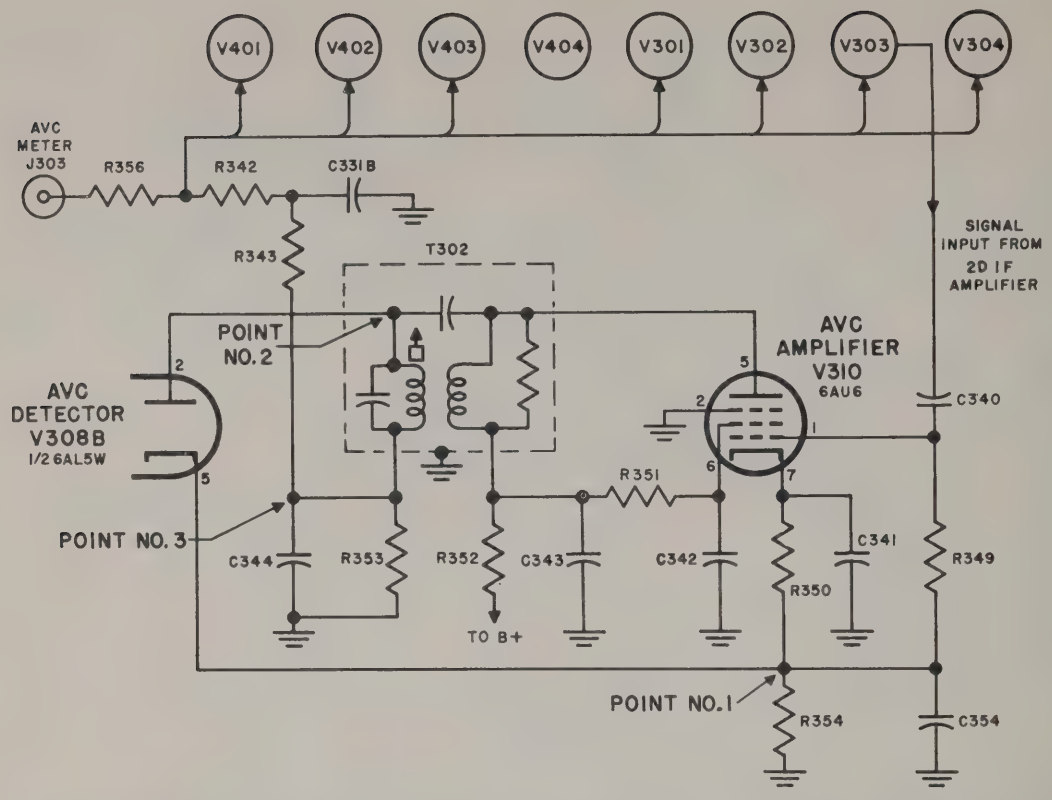


Figure 4-34. Radio Receiver R-361/GR, Automatic Volume Control, Simplified Schematic

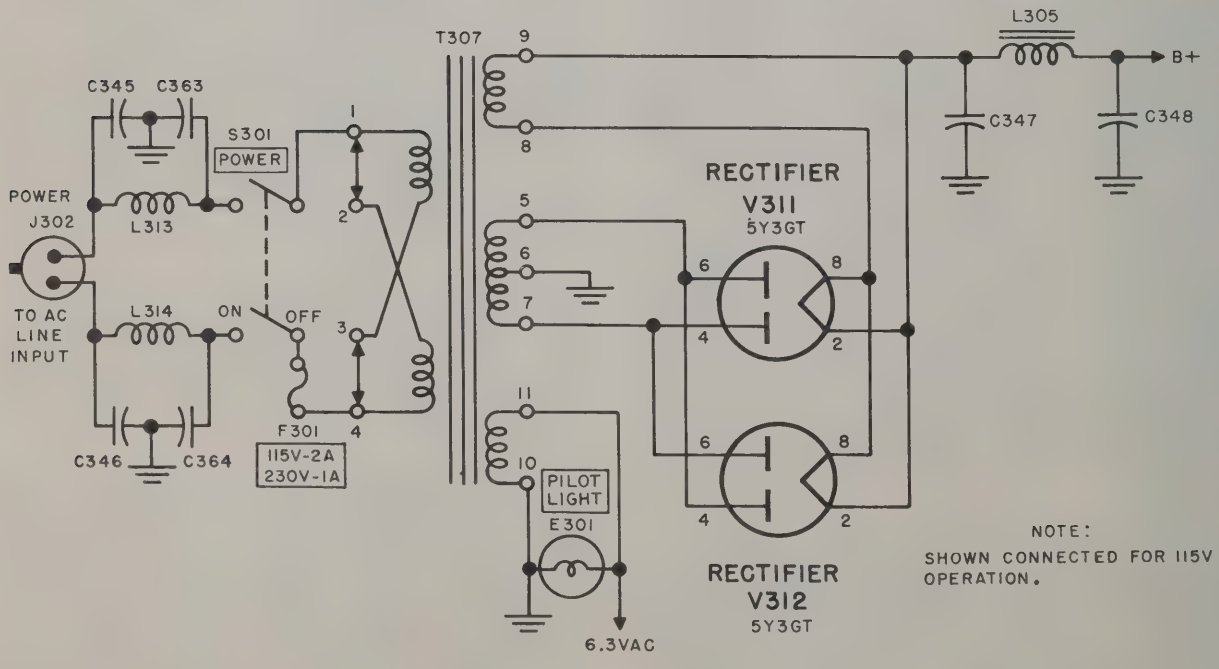


Figure 4-35. Radio Receiver R-361/GR, Power Supply, Simplified Schematic

is then fed back to the previous stages, and also ahead to the third i-f amplifier. Note that the avc voltage is derived from the second i-f amplifier V303, amplified and delayed by its own avc amplifier V310 and detected by its own V308B detector; the developed avc voltage is then applied to almost all stages in front of V303 and also to the third i-f amplifier V304. Such a system is called an amplified, delayed avc with forward feed.

4-57. POWER SUPPLY. (See figure 4-35.) A full-wave rectifier circuit is used for the power supply. V311 and V312 are connected in parallel, to provide the current and voltage requirements for Radio Receiver R-361/GR. A capacitor input filter network consisting of C347, C348 and L305 is used in the B+ line to reduce the ripple voltage. A high frequency capacitor input filter is incorporated in each side of the a-c line, to reduce radiation.

SECTION V

ORGANIZATIONAL AND SQUADRON MAINTENANCE

5-1. GENERAL.

5-2. The trouble shooting and repair work that can be performed at the organizational maintenance level is necessarily limited in scope by the tools, test equipment, and replaceable parts issued, and by the existing tactical situation. Accordingly, trouble-shooting is based on the performance of the equipment and the use of the senses in determining such troubles as burned-out tubes and fuses, loose connections, etc. The parts which follow in this section help in determining which sub-chassis or section of the receiver is at fault and in localizing the fault in that component to the defective stage or item, such as a tube or fuse. See Table 2-1 for required test equipment.

5-3. VISUAL INSPECTION.

5-4. Failure of this equipment to operate properly will usually be caused by one or more of the following faults:

a. Improperly connected Power Cable Assembly CX-1541/U between the receiver and Distribution Panel J-390/GR.
b. Improperly connected power cable assembly between the distribution panel and the primary source of power.
c. Worn, broken, or disconnected cords and plugs.
d. Wires broken because of excessive vibration.
e. Defective tubes.
f. Inactive (dirty or cracked) crystals.
g. Defective "R. F. GAIN" control.
h. Defective "A. F. GAIN" control.

5-5. When failure is encountered and the cause is not immediately apparent, check as many of the above items as is practicable before starting a detailed examination of the component parts of the system. If possible, obtain information from the operator of the equipment regarding performance at the time trouble occurred. Visually inspect the antenna system for obvious abnormalities, such as corrosion and insecure mechanical connections (table 5-3).

5-6. MINIMUM PERFORMANCE STANDARDS. (See figure 5-1.)

5-7. Table 5-1 serves as a checklist of minimum performance standards. In addition, it will help the operator to locate trouble in the equipment without taking off the dust cover or removal of the receiver from its operating position. Steps No. 1 through 7 and step No. 10 do not require test equipment. Perform step No. 8 at approximately 225, 300, and 399 mc. Make the checks and adjustments in the sequence indicated. Each step presumes satisfactory completion of all previous steps. In order to make the required checks, the conditions given below should be met.

a. The power supply at 115 or 230 volts, 50-60 cps.
b. A 600-ohm load connected to the output, eg, a 600-ohm headset plugged into the "AUDIO OUTPUT" jack on the front panel or a 600-ohm resistor connected to the "MUTING" terminals on the rear of the receiver.
c. Permit the equipment to warm-up for five minutes before making any checks.
d. The "AUDIO QUIETING DB" control in the extreme counterclockwise position.

5-8. The corrective measures listed under "Localization of Trouble" are those the operator can make without turning in the equipment for repairs. A reference in the table to Table 6-1 indicates that the trouble shooting must be done by an experienced repairman. If the set is completely inoperative or if the recommended corrective measures do not yield results, trouble shooting is necessary. However, if the tactical situation requires that communication be maintained and the set is not completely inoperative, the operator must maintain the set in operation as long as it is possible to do so. The fuse is accessible on the front panel of the receiver. Access to the tubes is gained by removing the dust cover, which can be done without taking the receiver out of its mounting rack. See paragraphs 5-22 and 5-23 for removal of pilot lamps, fuse, and tubes.

5-9. SYSTEMS TROUBLE ANALYSIS. (See figures 5-2 through 5-7.)

5-10. The tests that follow will aid in isolating the faulty section or sub-assembly of the receiver. To be effective the procedures should be followed in the order given. Remember that servicing procedure should cause no further damage to the equipment. To prevent further damage from possible short

TABLE 5-1. MINIMUM PERFORMANCE STANDARDS

Check or Adjustment	Test Equipment Required	Test Equipment Connections	Test Equipment Control Settings	Receiver Control Settings	Minimum Performance	Localization of Trouble
1. Headphones	None			Headphone plug inserted in "AUDIO OUTPUT" jack		
2. Power Cable Assembly CX-1541/U	None			Both ends connected securely.		
3. "POWER switch	None			"POWER" switch "ON".	Pilot lamp lights.	Rotate pilot light dimmer max counterclockwise. Check pilot light.
4. Audio	None			"R.F. GAIN" set at "9," "A.F. GAIN" set at "9," "SQUELCH" switch "OFF."	Rushing noise heard in headphones.	Check all tubes and cable assembly, power source, headphone cord and plug.
5. R-f circuits	None			Rotate "R. F. GAIN" control in either direction.	Strength of noise in headphones will vary.	"R. F. GAIN" control. See Table 5-2, step No. 4.
6. Audio circuits	None			Rotate "A. F. GAIN" control in either direction.	Strength of noise in headphones will vary.	"A. F. GAIN" control. See Table 5-2, step No. 3.
7. Squelch circuit.	None			"SQUELCH" switch "ON."	No noise in headphones if nothing connected to "ANT. INPUT" jack.	Squelch or AVC. See Table 6-1, step No. 6.
8. Overall receiver sensitivity.	1. Hewlett-Packard Signal Generator No. 608A. 2. Triplett No. 630-A Multimeter.	1. Connect signal generator to "ANT. INPUT" jack J401. 2. Connect multimeter to "MUTING" terminals on E303. Use multimeter "OUTPUT" and "COMMON" jacks.	1. Set multimeter on 3 V AC range. 2. Set signal generator for 5 microvolts output, 30 percent modulation, 1,000 cps. 3. Tune signal generator for max	1. Adjust "R. F. GAIN" control so that a 5 microvolt signal activates the squelch. 2. Turn "SQUELCH" switch to "OFF." 3. Adjust "A. F. GAIN" control for	2.45 V reading on the multimeter with modulation. Not more than 0.775 V without modulation. (Turn modulation selector switch on signal generator to "EXT. MOD".)	Noisy r-f amplifier tubes, V401 and/or V402. Check r-f and oscillator alignment.

Continued on next page.

TABLE 5-1. MINIMUM PERFORMANCE STANDARDS (CONT)

Check or Adjustment	Test Equipment Required	Test Equipment Connections	Test Equipment Control Settings	Receiver Control Settings	Minimum Performance	Localization of Trouble
8. Overall receiver sensitivity (cont).			output on multimeter.	2.45 V on multimeter meter with 3 microvolts input from signal generator.		
9. Audio output power	Same as above.	Same as above.	1. Set multimeter on 60 V AC range. Use "OUTPUT" and "COMMON" jacks. 2. Set signal generator for 50 microvolts output, 30 percent modulation, 1,000 cps. 3. Tune signal generator for max output on multimeter. 4. Note output on multimeter when signal gen set for 30 percent modulation, 400 cps.	Set "A. F. GAIN" control to max clockwise position.	At least 24.5 V reading on the multimeter	Audio amplifiers. See Table 5-2, step No. 3.
10. Antenna	None			Connect antenna transmission line cable to "ANT. INPUT" jack J401.	Increased noise in headphones when connection made to J401. Will hear transmitters operating on same channel that are within normal operating range.	Check connections to J401 and to antenna. Check antenna and transmission line for damage.

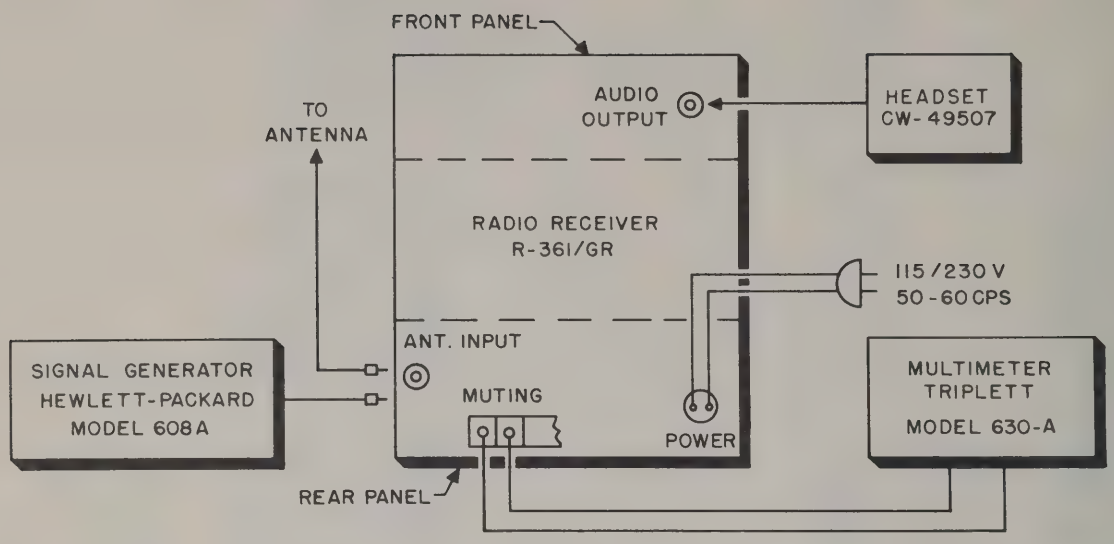


Figure 5-1. Radio Receiver R-361/GR, Minimum Performance, Recommended Test Set-Up

circuits make the resistance measurements that follow with the "POWER" switch turned "OFF".

5-11. CHECKING PRIMARY POWER INPUT CIRCUITS. If none of the tubes light up with the "POWER" switch turned "ON" and a new fuse does not correct the trouble, immediately turn the switch "OFF". Check the input circuit of power transformer T307 by performing the following steps in the sequence indicated.

a. Disconnect Power Cable Assembly CX-1541/U from "POWER" input connector J302.

b. Turn the "POWER" switch to the "ON" position and measure the resistance across the terminals of the "POWER" input connector J302. Normal indications are approximately 1.5 ohms when T307 is wired for 115-volt operation and approximately 6 ohms when wired for 230-volt operation. Infinite resistance indicates an open-circuit in L313, L314, primary of T307, "POWER" switch S301, or poor connections. Check connections at terminals of T307, including jumpers in primary. See paragraph 3-18 for power input connections. If the resistance measured is normal, proceed with step c.

c. Turn the "POWER" switch to the "OFF" position. Connect the ohmmeter test leads between the chassis and the center tab of C345. Normal indication is infinite resistance. Zero resistance indicates a short in C345 or C363.

d. Connect the ohmeter test leads between the chassis and the center tab of C346. Normal indication is infinite resistance. Zero resistance indicates a short in C346 or C364.

e. If the above tests indicate that the input circuit of T307 is satisfactory, proceed with paragraph 5-12.

5-12. CHECKING FILAMENT CIRCUITS. If the tests performed in paragraph 5-11 indicates that the input circuit of T307 is satisfactory, check the filament circuits by performing the following steps in the sequence indicated.

a. Remove the pilot light and all tubes. See paragraph 5-23 for instructions on removal of tubes.

b. Unsolder all wires from terminal No. 11 of power transformer T307. Connect the test leads of an ohmmeter between terminal No. 11 of T307 and the chassis. Normal indication is zero ohms. Infinite resistance indicates that the wire from terminal No. 10 to the chassis is open or the filament winding (terminal No. 10 to terminal No. 11) is open.

c. If a reading of zero ohms was indicated in step b, connect the ohmmeter test leads between the wires disconnected from T307, and the chassis. Normal indication is infinite resistance.

d. If zero resistance was indicated in step c, a short exists in the filament circuit external to the power transformer. Unsolder the two leads from the center tab of C428 on the r-f subassembly. Connect the ohmmeter test leads between the center tab of C428 and the chassis. Normal indication is infinite resistance. Zero resistance indicates a short in one or more of the filament bypass capacitors within the r-f subassembly. Check C404, C410, C418, C424, and C428. If infinite resistance was measured, proceed with step e.

e. Connect the ohmmeter test leads between the center

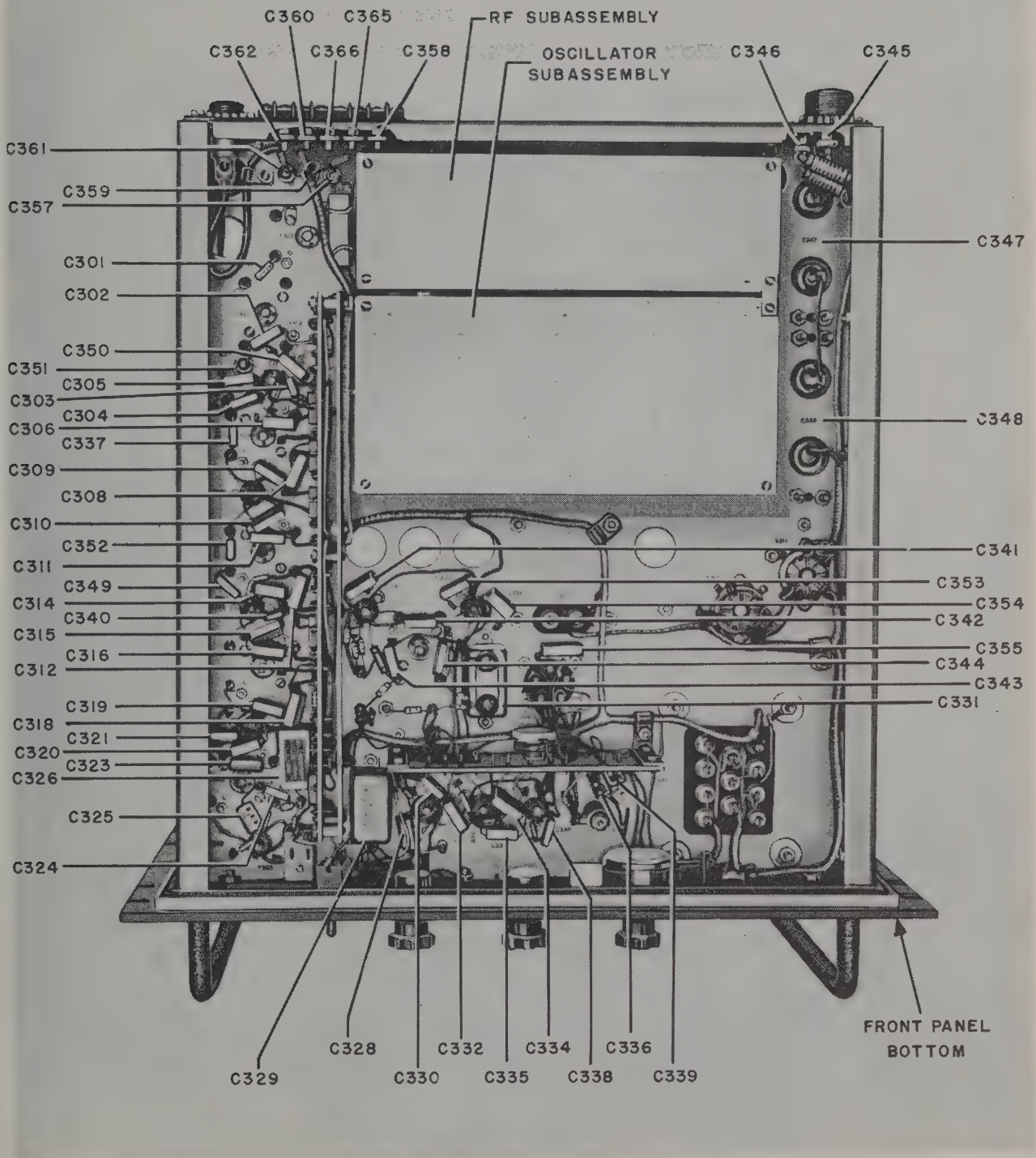


Figure 5-2. Radio Receiver R-361/GR, Bottom View, Location of Capacitors on Main Chassis

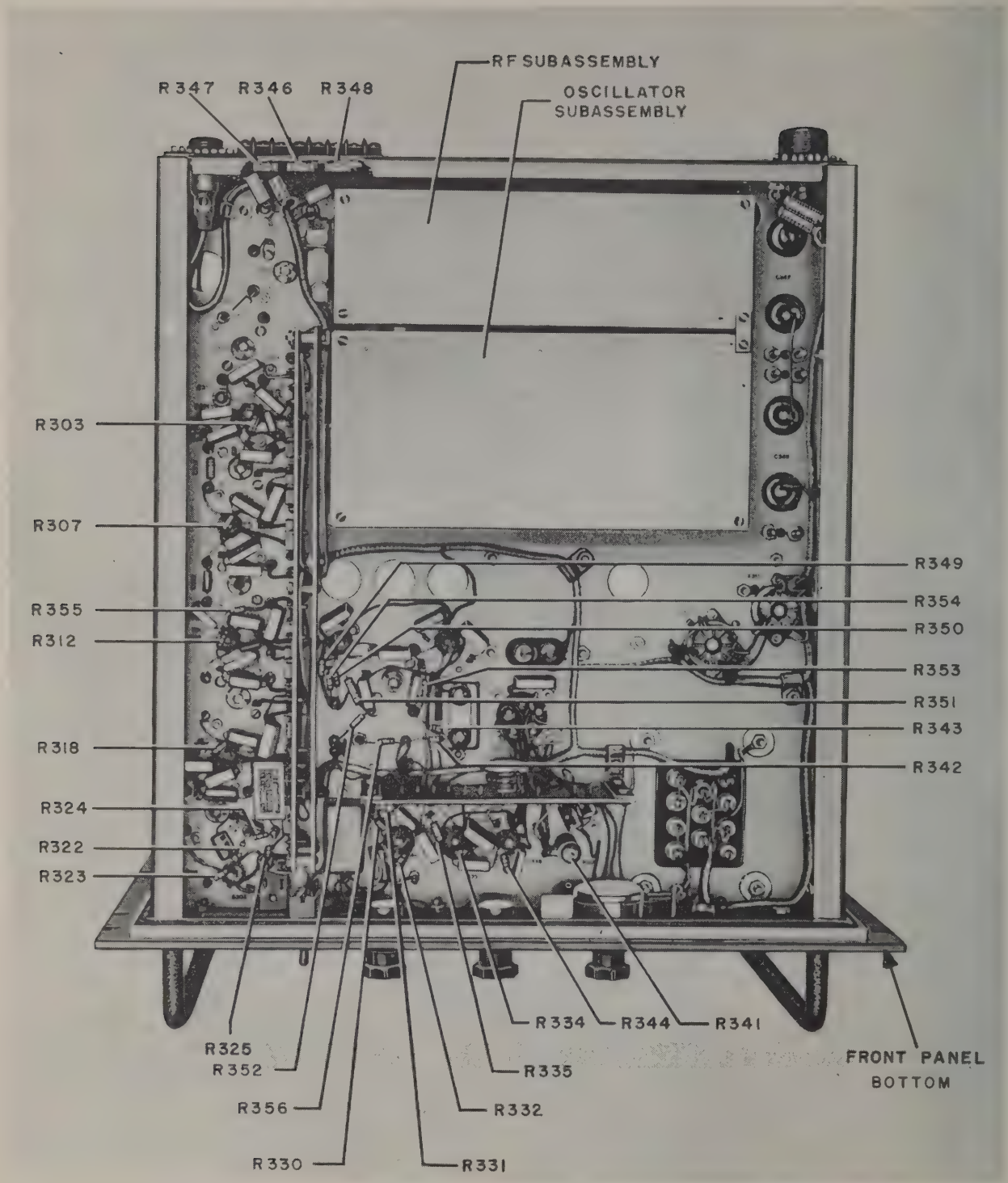


Figure 5-3. Radio Receiver R-361/GR, Bottom View, Location of Resistors on Main Chassis

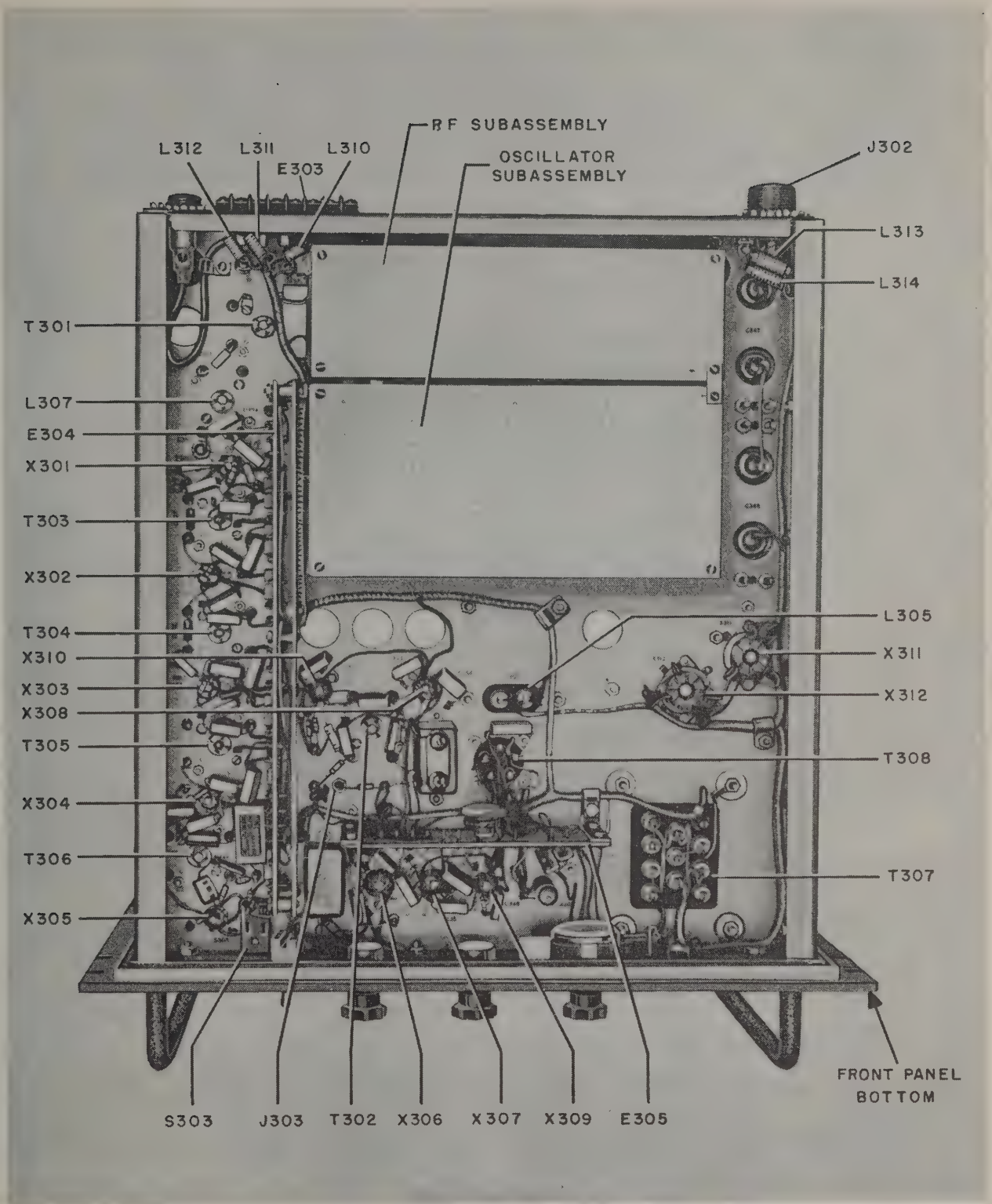
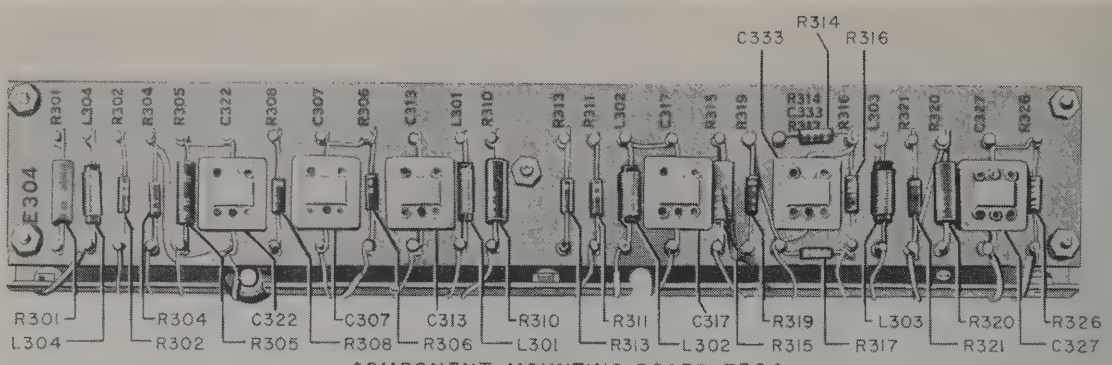


Figure 5-4. Radio Receiver R-361/GR, Bottom View, Location of Electrical Parts on Main Chassis



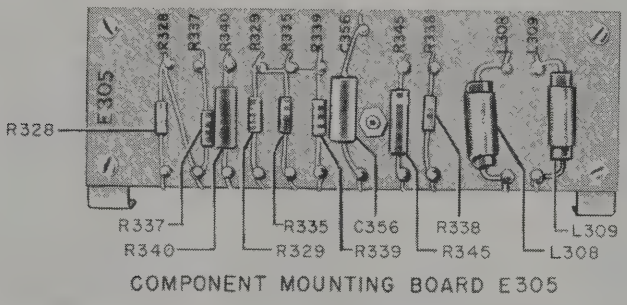


Figure 5-5. Radio Receiver R-361/GR, Location of Electrical Parts on Mounting Boards

tab of C530, on the oscillator subassembly, and the chassis (the leads from C428 still disconnected). Normal indication is infinite resistance. Zero resistance indicates a short in one or more of the filament bypass capacitors within the oscillator subassembly. Check C530, C531, C532, C536, C537, and C539.

f. If infinite resistance was measured in step e, the short exists in the filament circuit on the main chassis. Check C304, C310, C315, C317, C320, and C353.

5-13. Checking B+ CIRCUITS. Check the high voltage d-c circuits for shorts by performing the following steps in the sequence indicated.

a. Set controls as follows:

1. The "AUDIO QUIETING DB" control in the extreme counterclockwise position.
2. The "R.F. GAIN" control in the extreme counterclockwise position.
3. The "SQUELCH" switch in the "OFF" position.
4. The "NOISE LIMITER SWITCH" in the "ON" position.
5. The "A.F. GAIN" control in the extreme counterclockwise position.

b. Connect the ohmmeter test leads between the "hot" side of C348 (terminal with red lead) and ground. Normal indication is approximately 19,000 ohms. A reading of approximately 14,000 ohms indicates a short in C329. If a reading of less than 7,000 ohms is secured, proceed with step c.

c. Unsolder the two leads from the center tab of C429 on the r-f subassembly. Connect the ohmmeter test leads between the center tab of C429 and the chassis. Normal indication is infinite resistance. A reading of less than 6,000 ohms indicates a short in one or more of the plate bypass capacitors within the r-f subassembly. Check C406, C407, C413, C419, C425, C426, C429, C431, and C433. If infinite resistance was measured, proceed with step d.

d. Connect the ohmmeter test leads between the center tab of C529 and the chassis. Normal indication is infinite resistance. A reading of less than 4,000 ohms indicates a short in one or more of the plate bypass capacitors within the oscillator subassembly. Check C506, C511, C512, C515, C517, C520, C521, C522, C526, C527, C528, C529, C533, C535, and C538.

e. If infinite resistance was measured in step d, the short exists in the B+ circuit on the main chassis. Check C347, C348, C306, C311, C311, C316, C322, C323, C329, C338, and C342

5-14. GENERAL PRECAUTIONS. Whenever the receiver is serviced, observe the following precautions:

a. Be careful when the dust cover is removed; dangerous voltages are exposed.

b. Before a part is unsoldered, note the position of the leads. If the part, such as a transformer, has a number of connections, tag each of the leads to it.

c. Be careful not to damage other leads by pulling or pushing them out of the way.

d. Do not allow drops of solder to fall into the equipment, since they may cause short circuits.

e. A carelessly soldered connection may create a new fault. It is very important to make well-soldered joints, since a poorly soldered joint is one of the most difficult faults to find.

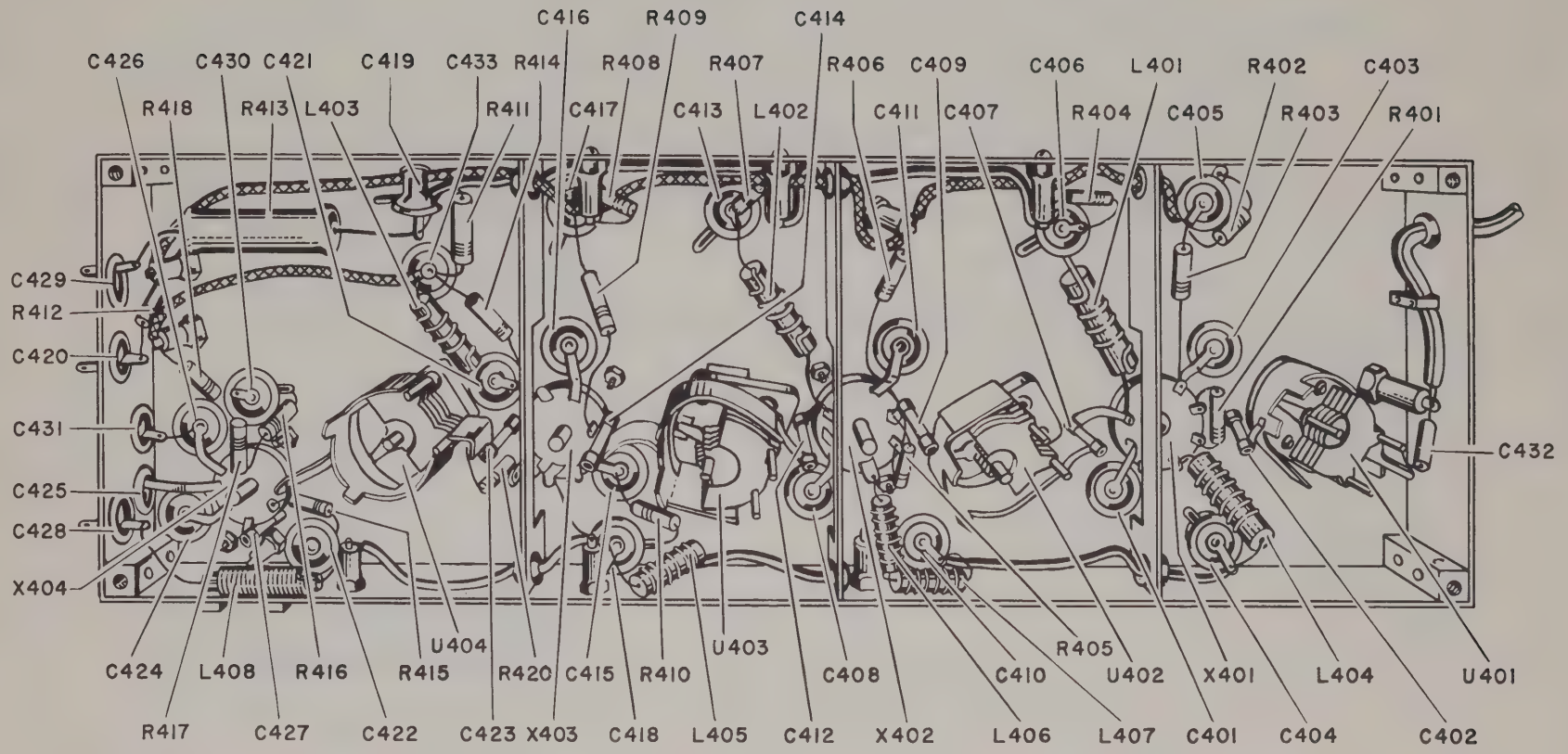


Figure 5-6. Radio Receiver R-361/GR, Bottom View, Location of Electrical Parts. R-F Subassembly

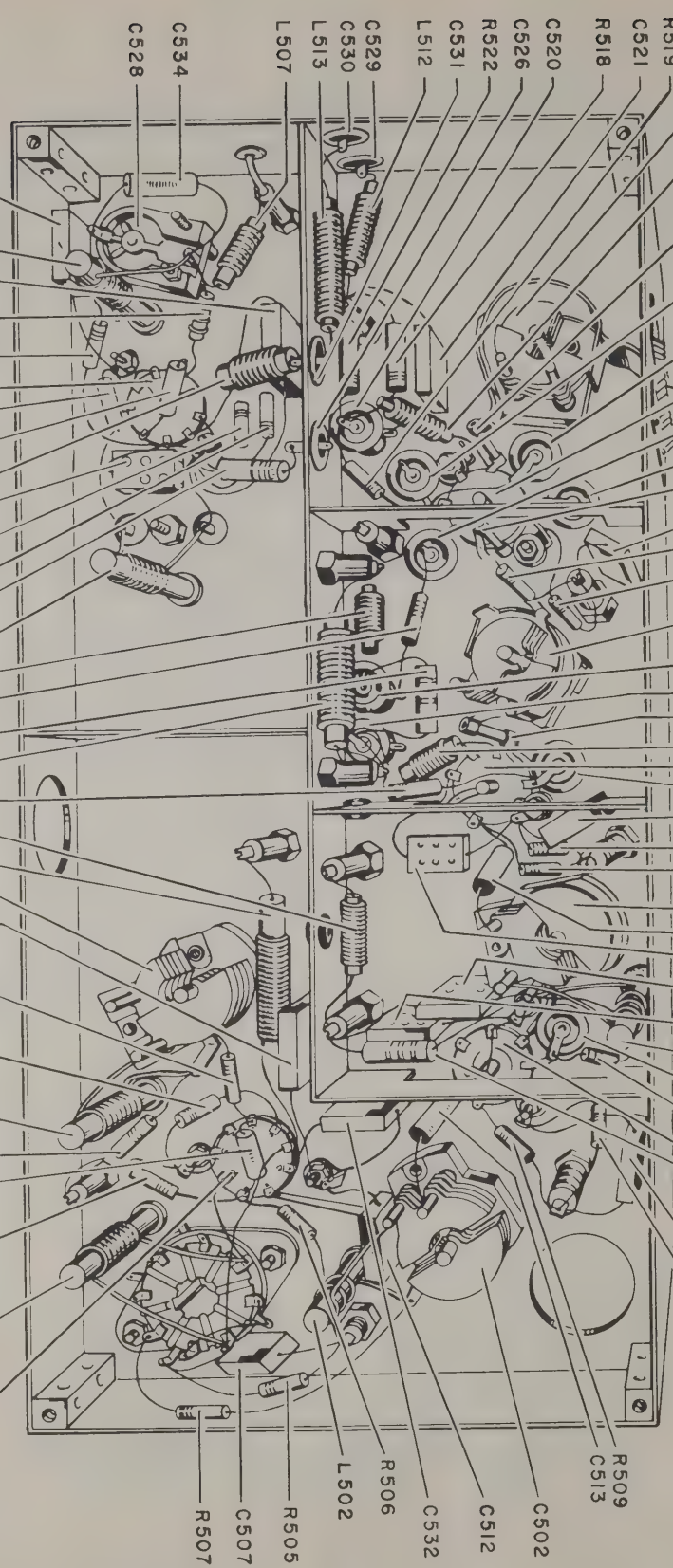


Figure 5-7. Radio Receiver R-361/GR, Bottom View, Location of Electrical Parts, Oscillator Subassembly

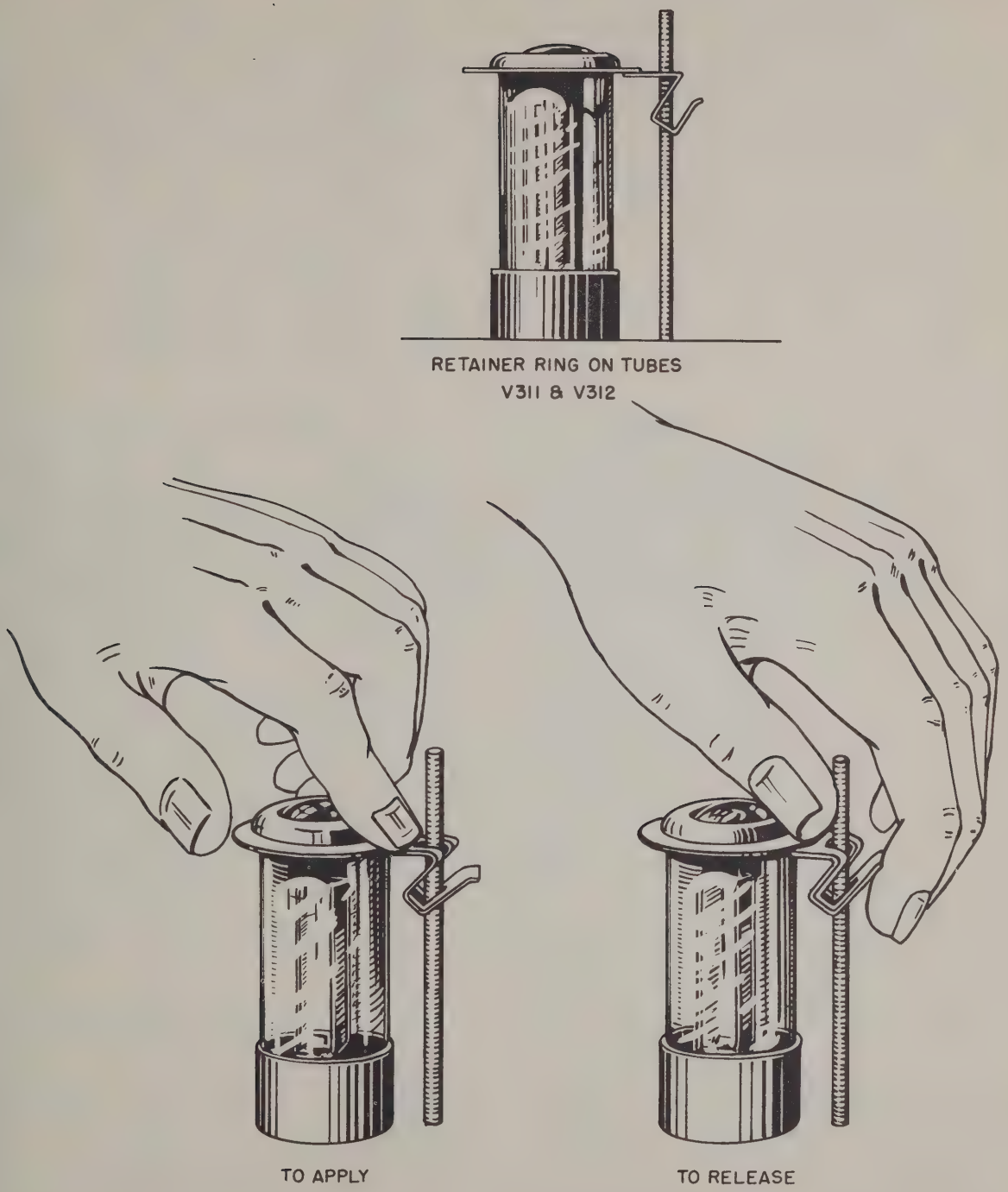


Figure 5-8. Operation of Retainer Rings

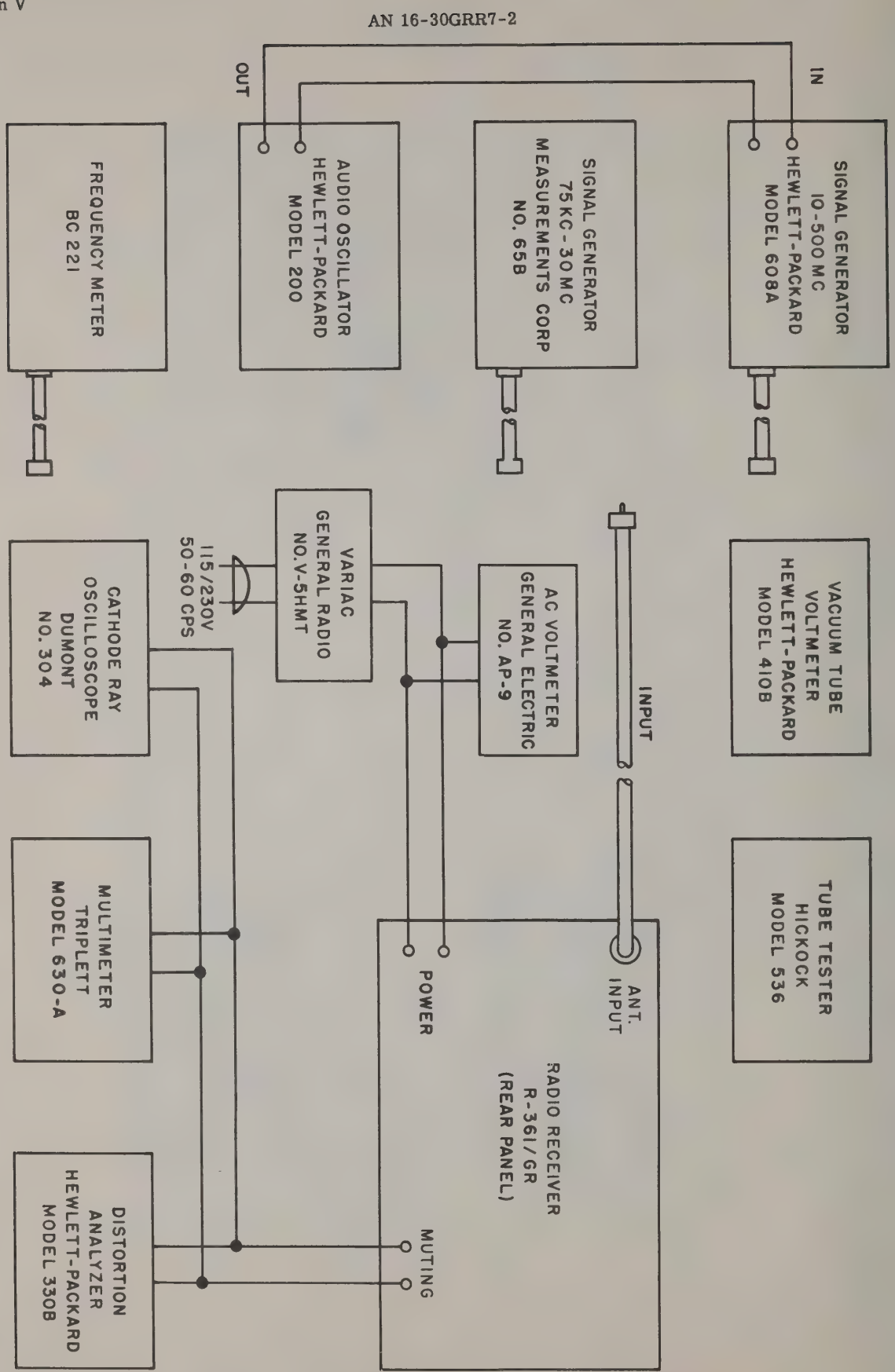


Figure 5-9. Radio Receiver R-361/GR, Recommended Bench Test Set-Up

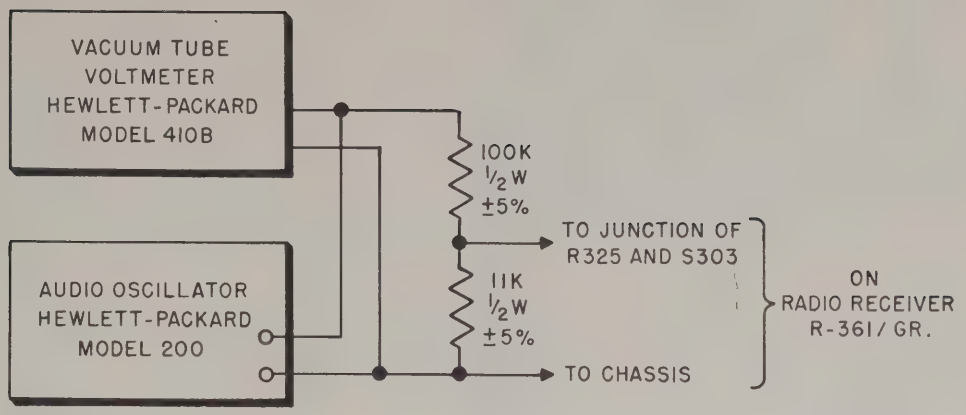


Figure 5-10. Radio Receiver R-361/GR, Recommended Set-Up for Testing Audio Section

f. When a part is replaced in r-f circuits, it must be placed exactly as the original one was. A part which has the same electrical value but different physical size may cause trouble in high-frequency circuits. Give particular attention to proper grounding when replacing a part. Use the same ground as in the original wiring. Failure to observe these precautions may result in decreased output or possibly in parasitic oscillations.

5-15. SYSTEMS TROUBLE ANALYSIS CHART. (See figures 5-9 and 7-16.) Table 5-2 outlines the step-by-step procedure necessary to determine or isolate a faulty section or subassembly of the receiver. This determination is done by means of major test points. A star-encircled arabic numeral is used to designate a major test point. This is an example of a major test point designation, 1. Make the checks in the sequence indicated. Each step presumes satisfactory completion of all previous steps.

5-16. REMOVAL OF SUBASSEMBLIES. (See figure 5-11.)

5-17. The r-f and oscillator subassemblies may be removed from the main chassis by following the instructions in paragraphs 5-18 and 5-19.

5-18. REMOVAL OF THE R-F SUBASSEMBLY. The r-f and oscillator subassemblies have interconnecting wires. It is therefore necessary to remove the covers of both of these subassemblies and disengage the connecting wires before either subassembly can be removed. In order to remove the r-f subassembly, perform the following steps in the sequence indicated.

a. Remove the tube shields over V403 and V404 by loosening or removing the screws holding the shields to main chassis.

b. Detach "ANT. INPUT" jack J401 by removing nuts, screws and lockwashers (four of each) holding jack and grounding fingers to rear of chassis.

c. Detach cable clamp, on cable connected to J401, by removing nut, screw, flat washer and lock washer.

d. Remove bracket shield from bottom of T301. One side is held in place with a lockwasher and nut, the other side with a lock washer and screw.

e. Unsolder leads from the five center tabs on feed-through capacitors. Total of seven leads. Make a sketch indicating color coding of wires and location of terminals in order to insure correct replacement.

f. Remove connecting grounding strap between r-f and oscillator subassemblies. Remove cover, held by screws and lock washers at each of the four corners of the subassembly.

g. Unsolder "connecting lead" from terminal post in r-f subassembly. Lead is from U502 in oscillator subassembly.

h. From top of chassis, remove screws and lock washers, each of four corners, and carefully lift out the r-f subassembly.

5-19. REMOVAL OF OSCILLATOR SUBASSEMBLY. (See figure 5-11.) The oscillator and r-f subassemblies have interconnecting wires. It is therefore necessary to remove the covers of both of these subassemblies and disengage the connecting wires, before either subassembly can be removed. In order to remove the oscillator subassembly, the steps indicated below should be followed:

a. Remove the three shields over V502, V503, and V504 by loosening or removing three screws.

b. Remove connecting grounding strap between r-f and oscillator subassemblies. Remove cover, held by screws and lock washers at each of the four corners of the subassembly.

c. Unsolder "connecting lead" from terminal post in r-f subassembly. Lead is from U502 in oscillator subassembly.

d. Unsolder brown and red lead on r-f subassembly. Make a sketch indicating color coding of wires and location of terminals in order to insure correct replacement.

TABLE 5-2. SYSTEMS TROUBLE ANALYSIS

Step	Test Points	Test Equipment Control Positions	Radio Receiver R-361/GR Control Positions	Normal Indication	Abnormal Indication
1. Power source.	Center tab of C345 and C346.	Set selector switch on Triplett Multimeter Model 630-A to 300 V AC. Connect meter across test point.	Set "POWER" switch to "ON."	Meter should read 115 V (±10 V) or 230 V (±20 V), depending on line voltage used.	No primary power supplied to the receiver. Open in Power Cable assembly CX-1541/U.
2. Power supply.	High potential side of C348 (terminal with red lead).	Set selector switch on Triplett Multimeter Model 630-A to 300 V DC. Connect meter from test point to gnd. Test point is pos, gnd is neg.	Set "POWER" switch to "ON."	205 V reading on the meter.	If zero, check fuse F301, power transformer T307 for open secondaries, filter choke L305 for open-circuit. If low, check for defective rectifier tubes V311 and V312. If high, open circuit beyond test point; see Table 6-2, step Nos. 1 through 3.
3. Audio section.	Jct of R325 and S303. "MUTING" terminals on E303.	Set freq dial on Hewlett-Packard Audio Oscillator Model 200 to 1,000 cps. Connect from test point to gnd through 10:1 voltage divider; see figure 5-10. Set selector switches on Hewlett-Packard Model 410B VTVM to 1 V AC. Connect vtvm to output terminals of audio osc. Set selector switch on multitester to 60 V AC and connect across test point Turn amplitude control on audio osc until a reading of 0.5 V is obtained on the vtvm.	Set "POWER" switch to "ON." Turn "A. F. GAIN" and "AUDIO QUIETING DB" controls to max clockwise position. Set "SQUELCH" switch to "OFF" position. Insert 600-ohm headphones in "AUDIO OUTPUT" jack J301 or connect 600-ohm, 2-watt resistor across "MUTING" terminals.	At least 25 V on the multimeter. Voltage divider provides 1/10 voltage output of audio osc to test point while permitting ease in reading vtvm.	Check V306, V307, V309. See Table 6-2, steps No. 8 through 10.

Continued on next page.

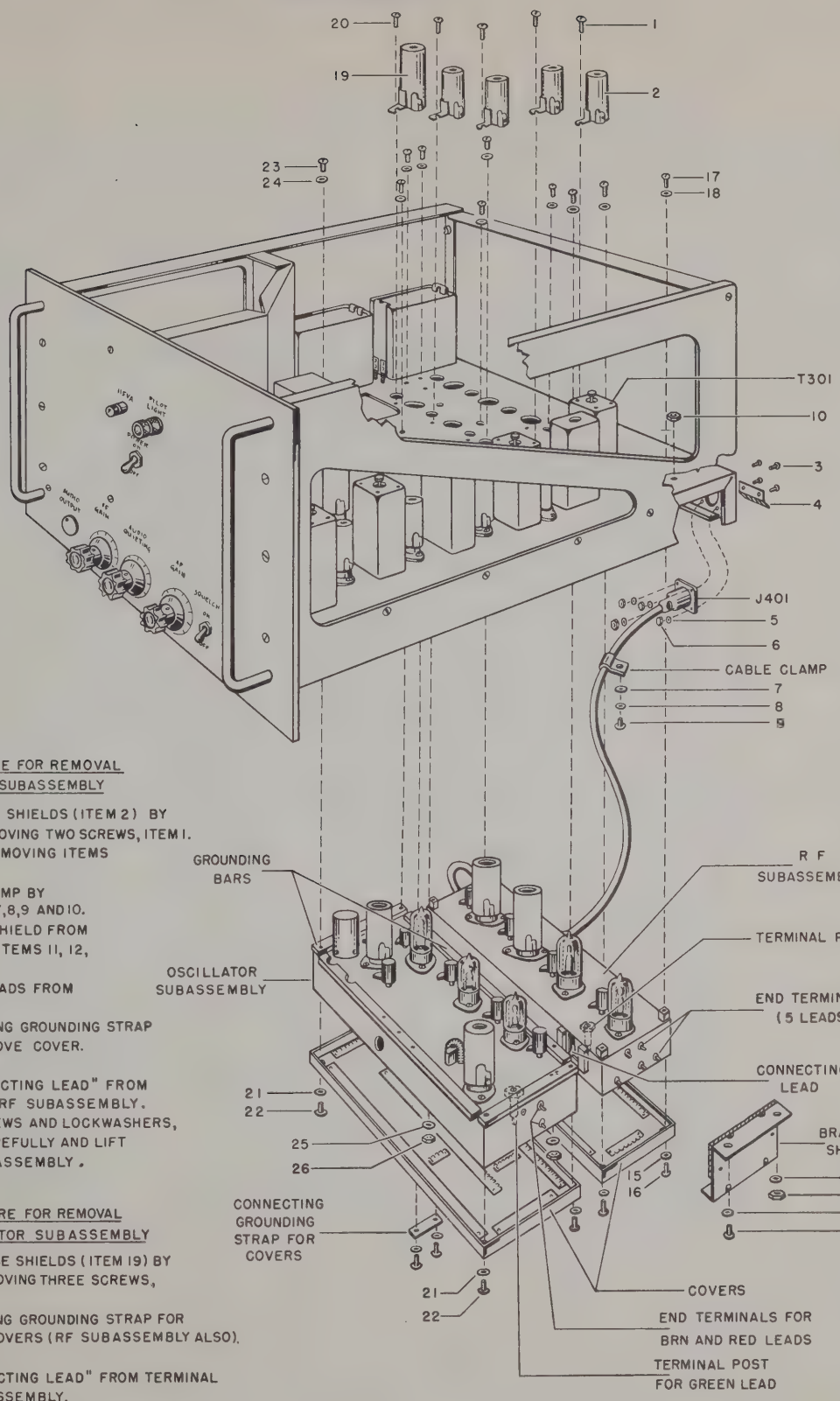
TABLE 5-2. SYSTEMS TROUBLE ANALYSIS (CONT)

Step	Test Points	Test Equipment Control Positions	Radio Receiver R-361/GR Control Positions	Normal Indication	Possible Cause of Abnormal Indication
4. Six mc i-f amplifier.	3 5 Center tab of C351.	Set selector switches on Hewlett-Packard Model 410B VTVM to -3V DC. Connect from test point 3 to gnd. Set controls on Measurements Signal Generator No. 65B for 500 uv output, 30 percent modulation, 1,000 cps. Connect from test point 5 to gnd through a 1,000 uuf capacitor. Tune, at 6 mc, for max output on vtvm.	Set "POWER" switch to "ON." Turn "R. F. GAIN" control to max clockwise position. Set "SQUELCH" switch to "OFF" position.	Approx 1.0 V - 2.0 V reading on the vtvm.	Check V301, V302, V303, V304, V305. See Table 6-2, steps No. 11 through 13.
5. 2nd osc.	6 Pin 1 of 2nd mixer tube V301.	Set selector switches on Hewlett-Packard Model 410B VTVM to -10 V DC. Connect from test point to gnd. (Use a 1 meg resistor on end of vtvm probe).	Set "POWER" switch to "ON."	At least 4 V reading on the meter.	Check V505. Check crystal Y502 by replacement with one known to be good. Check alignment of C528, "2nd OSC TUNING" (see Table 6-4, step No. 21).
6. 1st osc, triplers, amplifiers.	7 Pin 7 of 1st mixer V404.	Set selector switches on Hewlett-Packard Model 410B VTVM to 3 V AC. Remove cover from bottom of r-f subassembly. Connect from test point to gnd.	Set "POWER" switch to "ON."	At least 1 V reading on the meter.	Check V501, V502, V503, V504. Check crystal Y501 by replacement with one known to be good. Check alignment (see Table 6-4). See Table 6-2, steps No. 15 through 20.
7. R-f sub-assembly.	3 8 "ANT. INPUT" jack J401.	Set a Hewlett-Packard Signal Generator Model 608A as follows: Set for 30 percent modulation at 1,000 cps. Set tuning control for desired r-f freq. Set attenuator control	Set "POWER" switch to "ON." Turn "R. F. GAIN" control to max clockwise position. Set "SQUELCH" switch to "OFF" position. Set "NOISE LIMITER" switch to "OFF" position.	Between 1.5 and 8 V reading on the meter. Dependent on freq at test point 8, mutual conductance of	Check V401, V402, V403, V404. Check alignment. See Table 6-2, steps No. 22 through 26.

Continued on next page.

TABLE 5-2. SYSTEMS TROUBLE ANALYSIS (CONT)

Step	Test Points	Test Equipment Control Positions	Radio Receiver R-361/GR Control Positions	Normal Indication	Possible Cause of Abnormal Indication
7. R-f sub-assembly (cont).		for 3 uv. Connect to test point Set selector switches on Hewlett-Packard VTVM Model 410B to -10 V DC. Connect between test point and gnd.	Short avc bus to gnd with a jumper between the jct of R342, R343, C331 and gnd. Remove jumper after completion this step.	tubes, and how precisely the receiver has been aligned.	



PROCEDURE FOR REMOVAL OF RF SUBASSEMBLY

1 - REMOVE TWO TUBE SHIELDS (ITEM 2) BY LOOSENING OR REMOVING TWO SCREWS, ITEM 1.
2 - DETACH J401 BY REMOVING ITEMS 3, 4, 5 AND 6.
3 - DETACH CABLE CLAMP BY REMOVING ITEMS 7, 8, 9 AND 10.
4 - REMOVE BRACKET SHIELD FROM BOTTOM OF T301, ITEMS 11, 12, 13 AND 14.
5 - UNSOLDER FIVE LEADS FROM "END TERMINALS".
6 - REMOVE CONNECTING GROUNDING STRAP FOR COVERS. REMOVE COVER. ITEMS 15 AND 16.
7 - UNSOLDER "CONNECTING LEAD" FROM TERMINAL POST IN RF SUBASSEMBLY.
8 - REMOVE FOUR SCREWS AND LOCKWASHERS, ITEMS 17 AND 18 CAREFULLY AND LIFT OUT THE RF SUBASSEMBLY.

PROCEDURE FOR REMOVAL OF OSCILLATOR SUBASSEMBLY

1 - REMOVE THREE TUBE SHIELDS (ITEM 19) BY LOOSENING OR REMOVING THREE SCREWS, ITEM 20.
2 - REMOVE CONNECTING GROUNDING STRAP FOR COVERS. REMOVE COVERS (RF SUBASSEMBLY ALSO), ITEMS 21 AND 22.
3 - UNSOLDER "CONNECTING LEAD" FROM TERMINAL POST IN RF SUBASSEMBLY.
4 - UNSOLDER BRN AND RED LEAD ON RF SUBASSEMBLY.
5 - UNSOLDER GREEN LEAD FROM TERMINAL POST.
6 - REMOVE ITEMS 23, 24, 25 AND 26 CAREFULLY AND LIFT OUT THE OSCILLATOR SUBASSEMBLY.

Figure 5-11. Radio Receiver R-361/GR, Removal of Oscillator and R-F Subassemblies

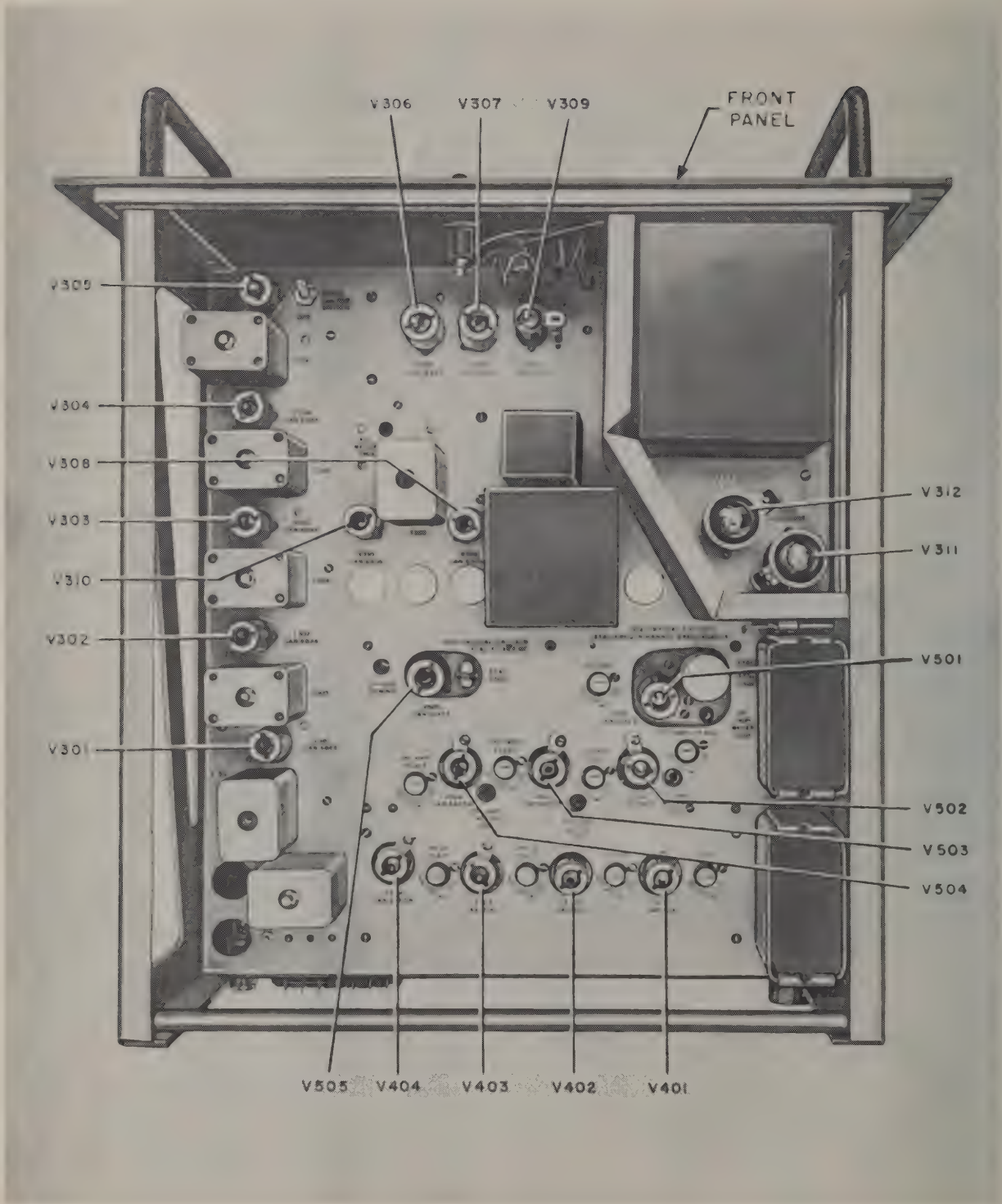


Figure 5-12. Radio Receiver R-361/GR, Top View, Tube Location

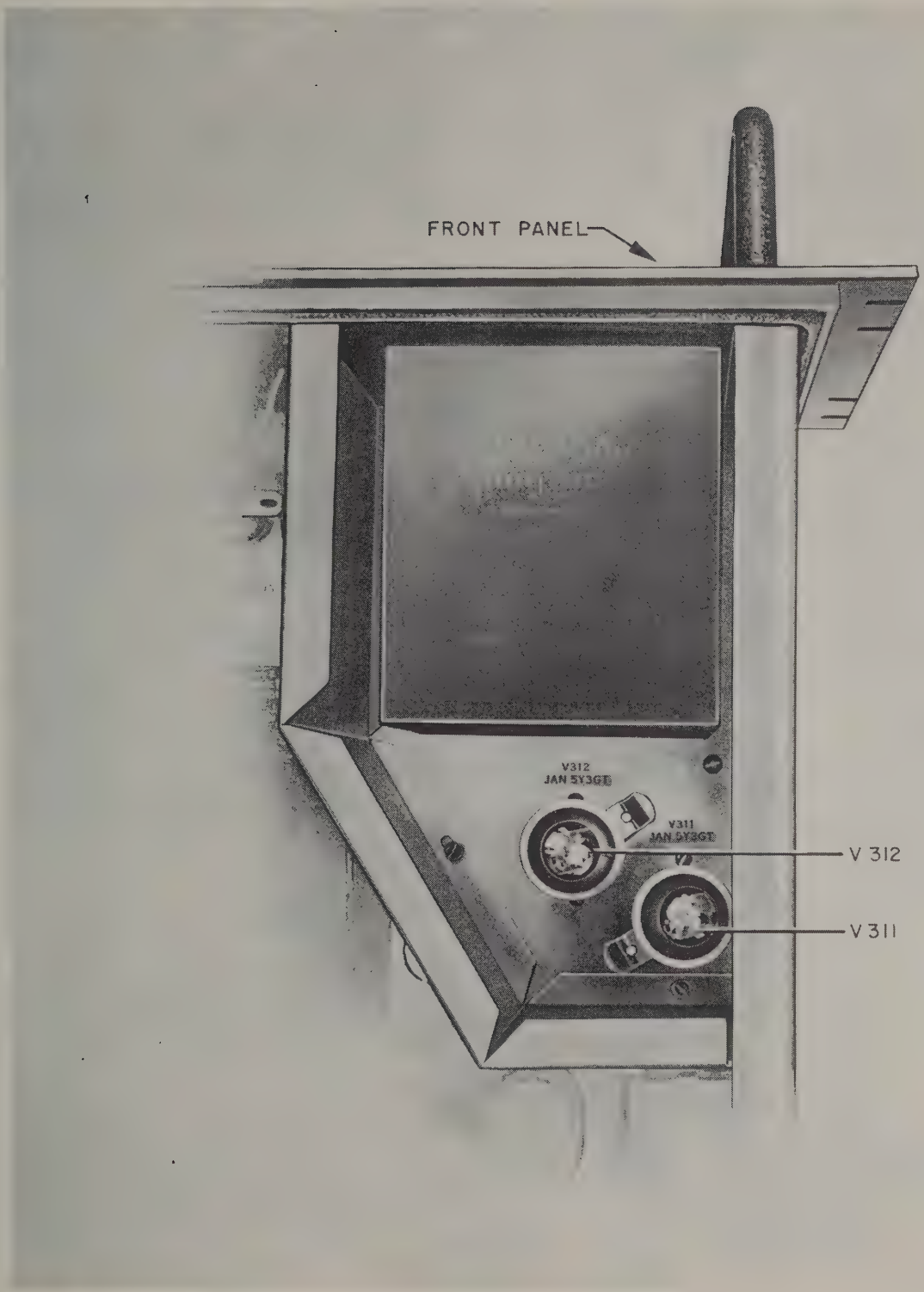


Figure 5-13. Radio Receiver R-361/GR, Power Supply Section, Dust Cover Removed

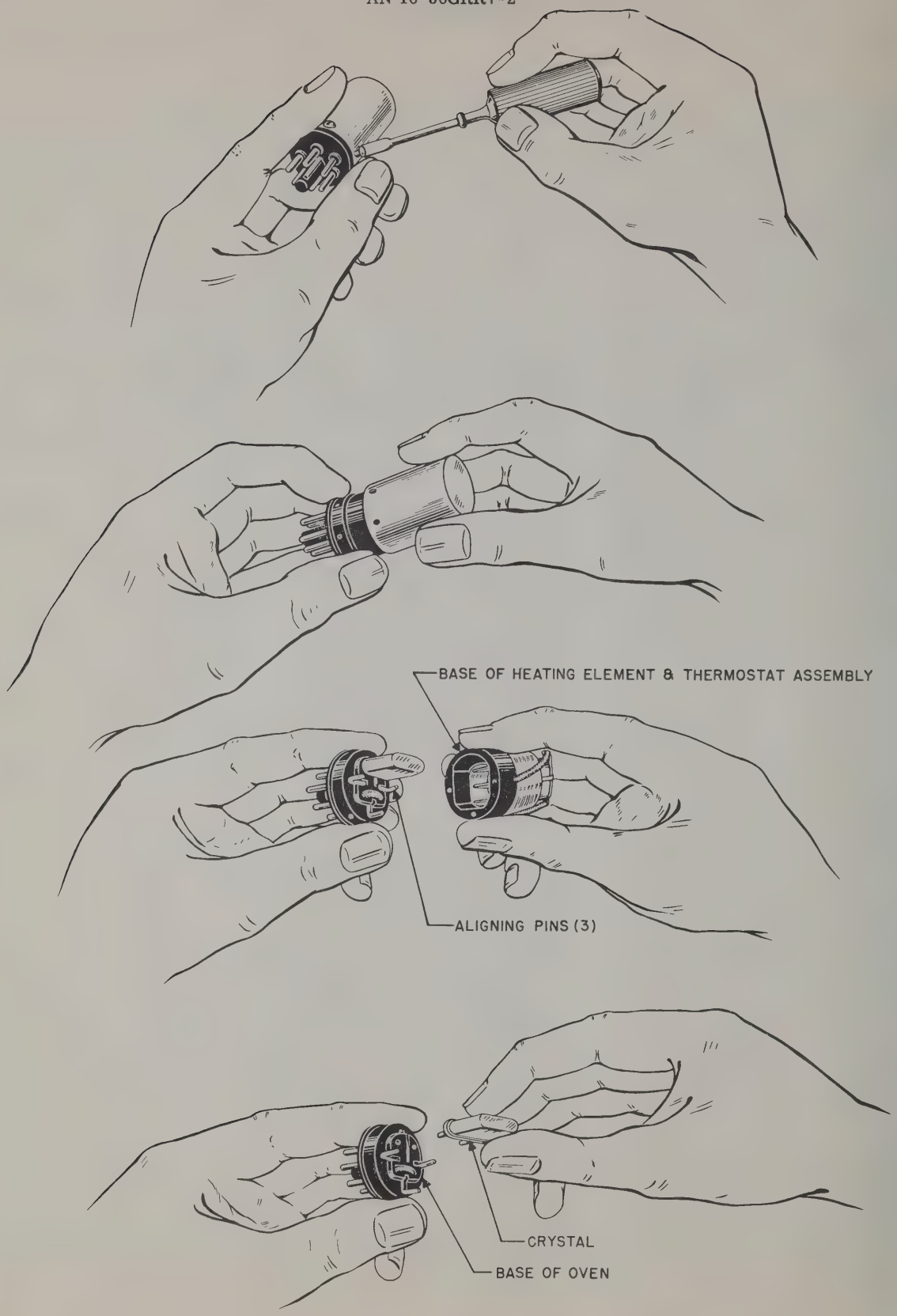


Figure 5-14. Radio Receiver R-361/GR, Crystal Y501 in Oven Assembly

e. Unsolder green lead from terminal post supporting L507 near tube socket X507 (for V507).
f. From top of chassis, remove screws and lock washers, each of four corners, and one screw and lockwasher near filter choke L305. Remove two screws, nuts, and lock washers located approximately one inch from, and in line with two of the four above screws.

5-20. MINOR REPAIRS AND ADJUSTMENTS.

5-21. The repairs that follow consist of replacing fuses, pilot lamps, tubes, crystals, and simple adjustments.

5-22. CHECKS TO MAKE IF THE PILOT LAMP IS OUT AND NO SOUND CAN BE HEARD.
a. Examine the pilot lamp. If this is defective, replace it with a 6-8 V, 0.15 amp bulb. To replace the pilot lamp, unscrew the jewel guard of the "POWER" indicator lamp and remove the bayonet-base lamp by pushing in and turning counterclockwise. If the pilot lamp remains unlit and no sound can be heard, proceed with the following step.
b. Examine the fuse. This equipment contains one fuse located on the front panel. For 115-volt operation, the correct fuse rating is 2 amp. For 230-volt operation, a 1-amp rated fuse should be used. Replace a blown fuse with one of the same rating. Rotate the fuse holder counterclockwise. The fuse can then be extracted from its holding sleeve. If the pilot lamp remains unlit after the fuse has been replaced, and no sound can be heard, check the "POWER" input connector J302 at the rear of the chassis.

5-23. CHECKS TO MAKE IF THE PILOT LAMP IS ON AND NO SOUND CAN BE HEARD.
a. Check the tubes. In order to inspect the tubes, it is necessary to disconnect all cables in the rear of the equipment, and remove the dust cover. After the dust cover has been removed, reconnect all cables. The power is now turned on.

WARNING

Line voltage exists on the rear of the front panel. Take all possible precautions to avoid injury, while inspecting the interior of the equipment. With the power turned on, the tubes will become very hot. Exercise care while working inside the equipment.

b. Examine each tube to see if it is lit. Remove any tube which shows no light.
c. All miniature tubes, with the exception of V309, are covered by metal shields. To remove the shields, press down gently and turn counterclockwise 1/8th of a turn, then lift off. If the tubes do not release easily, rock them slightly and then pull upward. Label each tube as soon as it is removed, in order to insure proper replacement.
d. V309 (see figure 5-12) is a miniature tube which is held in place by a Birtcher clamp. In order to extract this tube, raise the lid of the clamp and turn 90 degrees.
e. Tubes V311 and V312 are located on the main chassis, and can only be reached from the side of the rack. The location of these tubes is shown on figure 5-13. V311 and V312 are held in position by retainer rings. These rings can be removed in the following manner: Place the index finger on top of the threaded rod, and place the thumb on the outer edge of the ring tab. By pressing the thumb and index finger together, the retainer will come off. To replace the retainer ring, place the hole in the tab over the screw, and apply pressure downward at the spot where the tab joins the ring. Continue to exert pressure until the ring fits snugly over the tube.
f. If after replacing any unlit tubes no sound can be heard, replace each tube in the equipment. Proceed in the task by replacing one tube at a time. Make certain the replacement tube is in its socket before another tube is removed. By following this procedure, the possibility of misplacing a tube will be eliminated.
g. If no sound can be heard after replacing all the tubes, check the crystals.

5-24. METHOD OF CHECKING CRYSTALS. There are two crystals in this equipment, designated Y501 and Y502. Both crystals are located in the oscillator section, and may be checked as follows: Using a d-c vtvm, connect the meter to the "1st TRIPL METER" jack J501, and tune the "1st OSC" adjustment C501 for a peak in the meter. Check to see that "1st OSC" tuning dial indicates desired frequency and not an undesired harmonic of the crystal. Refer to figure 1-3 if dial calibration is worn off chassis. If no peak can be noted on the meter, examine crystal Y501. (See figure 5-14.)

5-25. Crystal Y501 is contained in an oven, A501. The crystal may be removed from the oven as described below.
a. Remove three screws at the bottom of the oven.
b. Hold the base of the oven with the left hand, and pull off the cover with the right hand.
c. With the right hand, grasp the bakelite base of the heating element and thermostat assembly, and pull straight out. The crystal, held in a HC-6/U holder, is now exposed and may be removed.
d. Replace the crystal with another one of the same frequency.
e. After replacing the crystal, align the three pins on the base with the three openings on the resistance and thermostat assembly. Press the cover closed and replace the three screws. Make certain the cover is absolutely aligned with the base, before securing the screws, since the screws strip very easily.
f. Try to retune the first oscillator according to the instructions given in Table 6-4, step d.
g. If a peak is noted on the meter, but the set does not operate, replace the second crystal Y502, with another crystal of the same frequency.
h. Try to retune the second oscillator as follows: Connect a d-c vtvm in the "AVC METER" jack J303. Feed a signal of desired frequency from a transmitter or signal generator into the "ANT. INPUT" jack J401. Tune the "2nd OSC TUNING" control C528 for a peak in the meter.

CAUTION

Limit the strength of the signal to a maximum of one volt when using a transmitter.

5-26. INSPECTION SCHEDULE.

5-27. The items requiring regular inspection are listed in Table 5-3.

TABLE 5-3. INSPECTION SCHEDULE

Component	Inspection	Time
Radio Receiver R-361/GR	Note if a signal or receiver noise can be heard in headset or loudspeaker.	Daily
Antenna	Visually inspect antenna system for obvious abnormalities. Connections should be mechanically secure.	Weekly
Radio Receiver R-361/GR	Clean all accessible parts without removing dust cover. Check cable assemblies at the rear of the chassis. Connections should be mechanically secure and not corroded.	Weekly
Crystal Y502	Check prongs for corrosion.	Monthly
Radio Receiver R-361/GR	Check minimum performance as per Table 5-1.	Monthly

SECTION VI

FIELD AND FASRON MAINTENANCE

6-1. GENERAL.

6-2. The first step in servicing a defective equipment is to sectionalize the fault by tracing the trouble to the subassembly or section responsible for the abnormal operation of the receiver. See Section V. The second step is to localize the fault by tracing the trouble to the defective part responsible for the abnormal condition. Some faults such as burned-out resistors, r-f arcing, and shorted transformers can often be located by sight, smell, and hearing. The majority of faults, however, must be localized by voltage and resistance measurements. See Table 2-1 for required maintenance test equipment.

6-3. MINIMUM PERFORMANCE STANDARDS. (See figure 5-9.)

6-4. Table 6-1 is provided to indicate adjustment procedures and minimum performance standards for a repaired Radio Receiver R-361/GR. In order to make the required checks, the conditions given below should be met unless otherwise noted.

a. The power supply at 115 or 230 volts, 50-60 cps.
b. Radio frequency signals of approximately 225, 300 and 399 mc.
c. A standard signal of 3-uv, 30-percent modulation, at 1,000 cps.
d. A 600-ohm resistive load across the "MUTING" terminals on the rear of the receiver.
e. Permit the equipment to warm-up for five minutes before making any checks.
f. Set the "R.F. GAIN' control so that a 5-uv signal operates the squelch, and supplies an audio signal when the "SQUELCH" switch is in the "ON" position.
g. Set the "SQUELCH" switch in the "OFF" position.
h. Set the "NOISE LIMITER SWITCH" in the "ON" position.
i. Set the "AUDIO QUIETING DB" control in the extreme counterclockwise position.
j. Set the "A.F. GAIN" control for 10-mw output (2.45 V).

6-5. SYSTEMS TROUBLE ANALYSIS.

6-6. The tests that follow aid in isolating the source of trouble. To be effective the procedure should be followed in the order given. Remember that servicing procedure should cause no further damage to the equipment. First, trouble should be localized to a single stage or circuit. Then the trouble may be isolated within that stage or circuit by appropriate voltage, resistance, and continuity measurements.

6-7. VISUAL INSPECTION. The purpose of visual inspection is to locate any visible trouble. See paragraph 5-3. Through this inspection alone, the repairman may frequently discover the trouble, or determine the stage in which the trouble exists. This inspection is valuable in avoiding additional damage to the equipment which might occur through

TABLE 6-1. MINIMUM PERFORMANCE STANDARDS

Check or Adjustment	Test Equipment Required	Test Equipment Connections	Test Equipment Control Settings	Receiver Control Settings	Minimum Performance	Localization of Trouble
1. I-f bandwidth.	Measurements Corp. Signal Gen No. 65B. Freq Meter BC221 with headset. Hewlett-Packard VTVM Model 410B.	Connect one side of a 0.05 uf capacitor in series with "hot" output lead from signal gen. Connect other side of the capacitor to center tab of C351. Connect gnd lead of signal gen to receiver chassis with short length of heavy bus wire. Keep connecting lead lengths to a min. Connect vtvm between jct of R325, S303 and gnd. Wrap insulated wire, from output term of BC221, ground output lead of signal gen. (See figure 6-1.)	1. Set signal gen for 500-uv output, 30 percent modulation, 1,000 cps, and tuned to 6 mc. 2. Set vtvm on -3 V DC range. 3. Tune signal gen to exact valley between response peaks, as noted on the vtvm. 4. The reading on the vtvm is the ref level. 5. Check the freq in step No. 3 by zero-beating the BC221 against the signal gen. 6. Set the signal gen output to 1,000 uv (6 db) and tune above and below the center freq to a point where the ref level is observed on the vtvm. 7. Check the freq in step No. 6 against the BC221. 8. Repeat steps No. 6 and 7 for 500,000 uv output (60 db) from the signal gen.	Set "R. F. GAIN" control in extreme clockwise position. Set "AUDIO QUIETING DB" control in extreme counterclockwise position. Set "A. F. GAIN" control in extreme counterclockwise position. Set "SQUELCH" switch in "OFF" position. Set "NOISE LIMITER SWITCH" in "OFF" position. Short avc to gnd at jct of R342, R343, C331. Remove short after completion this check.	Note: Center freq is taken as 0 db. Serial Nos. 800 and above: 1. At 6 db the bandwidth should be greater than 60 kc. 2. At 60 db the bandwidth should be less than 175 kc. Serial Nos. below 800: 1. At 6 db the bandwidth should be greater than 85 kc. 2. At 60 db the bandwidth should be less than 225 kc.	I-f misalignment. For alignment procedures see Table 6-3, step a.

Continued on next page.

TABLE 6-1. MINIMUM PERFORMANCE STANDARDS (CONT)

Check or Adjustment	Test Equipment Required	Test Equipment Connections	Test Equipment Control Settings	Receiver Control Settings	Minimum Performance	Localization of Trouble
2. Overall frequency accuracy. Part I.	Same as for i-f bandwidth check.	Same as for i-f bandwidth check.	Same as 1st 5 steps for i-f bandwidth check.	Same as for i-f bandwidth check.	6.0 mc ±1 kc.	Same as for i-f bandwidth check.
3. Overall frequency accuracy. Part II.					If freq accuracy of Y501 doubtful, replace with one known to be good. If no replacement available, check Y501 as per next step.	Y501
4. Overall frequency accuracy. Part III.	Freq Meter BC221 with headset.	Wrap insulated wire, from output term of BC221, around V501 (tube shield removed). See figure 6-2. Increased freq measuring accuracy obtainable if BC221 coupled to V502 instead of V501 - if sufficient output can be secured from V502.	Check the freq of Y501 by zero-beating the BC221 against the signal picked up from V501. Several beat-notes can be tuned in as the fundamental range of the BC221 is 2,000 to 4,000 kc. Check on at least two sub-harmonics of Y501.	Not critical.	±1 kc of freq indicated on crystal holder.	Y501
5. Overall frequency accuracy. Part IV.	Freq Meter BC221 with headset.	Wrap insulated wire, from output term of BC221, around V505 (tube shield removed).	Same technique as for checking Y501. If beat-note too weak, test Y501 in "XTAL" oven A501. Retune "1st OSC" C501 to 350 mc, couple BC221 to V501, get beat-note.	Not critical.	±2 kc of freq indicated on crystal holder.	Y502

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TABLE 6-1. MINIMUM PERFORMANCE STANDARDS (CONT)

Check or Adjustment	Test Equipment Required	Test Equipment Connections	Test Equipment Control Settings	Receiver Control Settings	Minimum Performance	Localization of Trouble
6. Squelch circuit.	Hewlett-Packard Signal Gen Model 608A. Hewlett-Packard VTVM Model 410B.	Connect signal gen to "ANT. INPUT" jack J401. Connect vtvm between gnd and jct of R325, S303.	Set signal gen for 30-percent modulation, 1,000 cps. Set tuning control for desired r-f freq. Set attenuator for 5 uv. Tune for max output on vtvm while "R. F. GAIN" control at max clockwise position. Set vtvm on -3 V DC range.	Plug 600-ohm head set into "AUDIO OUTPUT" jack J301. Set "SQUELCH" switch to "OFF" position. Set "R. F. GAIN" control to extreme clockwise position. Set "A. F. GAIN" control for clearly audible signal in head set. Set "R. F. GAIN" control to extreme counterclockwise position and then turn slowly in clockwise direction until signal suddenly "pops" into head set.	Signal in head set when "R. F. GAIN" control at max clockwise position. No signal in head set when "R. F. GAIN" control at max counterclockwise position. Signal comes on very suddenly when "R. F. GAIN" control turned clockwise from the extreme counterclockwise position.	Check V307, V308, V306. See Table 6-2, step No. 30.
7. Sensitivity.	This test is the same as step No. 8, Table 5-1.					
8. Power input.	General Radio Variac Type V-5HMT. General Electric AC Voltmeter No. AP-9, 150/300 volt scales. General Electric Wattmeter No. AP-9, 1 amp,	Connect input of variac to source of a-c power and output to "POWER" input connector J302 on rear of receiver. Connect current coils of wattmeter in series with the line and the voltage coil across the line.	Turn control knob on variac in a clockwise direction, from initial extreme counterclockwise position, until a-c voltmeter reads same voltage as indicated on voltage designation nameplate, rear of receiver dust cover.	Adjust "R. F. GAIN" control so that a 5-uv signal activates the squelch. Turn "SQUELCH" switch to "OFF". Adjust "A. F. GAIN" control for 2.45 V on meter with 3-uv input from signal gen.	Less than 150 watt reading on wattmeter.	See paragraphs 5-9 through 5-13.

Continued on next page.

TABLE 6-1. MINIMUM PERFORMANCE STANDARDS (CONT)

Check or Adjustment	Test Equipment Required	Test Equipment Connections	Test Equipment Control Settings	Receiver Control Settings	Minimum Performance	Localization of Trouble
8. Power input (cont).	150/300 watts. Hewlett-Packard Signal Gen Model 608A. Triplett Multimeter Model 630-A	Connect a-c voltmeter across voltage terminals of wattmeter. See figure 6-3 for power input connections. Connect multimeter to "MUTING" terminals on rear of receiver. Use "OUTPUT" and "COMMON" jacks. Connect signal gen to "ANT. INPUT" jack J401.	Set multimeter on 3 V AC range. Set signal gen for 3-uv output, 30-percent modulation, 1,000 cps. Tune signal gen for max output on multimeter.			
9. Image rejection.	Same as for sensitivity check.	Same as for sensitivity check.	Same as paragraph 6-4. Retune signal gen to image freq (desired freq minus two times the 1st IF freq). For example the image freq of 250 mc is: 250 - 2x40.4 = 169.2 mc. Adjust signal gen for 30,000-uv output and tune for max reading on multimeter. Readjust output of signal gen for 2.45 V reading on multimeter	Same as paragraph 6-4.	The ratio: input at image freq input at desired freq, over 1,000:1.	Check alignment of r-f tuning controls. Repair or replace units (U401, U402, U403, U404) that do not tune sharp.

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TABLE 6-1. MINIMUM PERFORMANCE STANDARDS (CONT)

Check or Adjustment	Test Equipment Required	Test Equipment Connections	Test Equipment Control Settings	Receiver Control Settings	Minimum Performance	Localization of Trouble
10. AVC characteristic.	Same as for sensitivity check	Same as for sensitivity check.	Record the output readings with signal inputs of 10, 100, 1,000, 10,000 and 100,000 uv. Increase the input signal to 1 V and record the output reading. See figures 7-6, 7-7 and 7-8.	With 50-uv input, 30-percent modulation, 1,000 cps adjust "A. F. GAIN" control for 1 w (24.5 V) across 600 ohms. All other controls as per paragraph 6-2.	A max change of 4-db in output from 10 to 100,000 uv. Not more than 6-db above 1 w (24.5 V) audio output with 1 V input. Note reading on DB scale of multimeter.	Check V308, V310. Check alignment of T302. See Table 6-4, step b.
11. Noise limiter.	Same as for sensitivity check. Dumont Oscilloscope No. 304.	Same as for sensitivity check. Connect vertical amplifier input terminals of oscilloscope between gnd and jct of R325, S303.	Set signal gen for 5-uv output, 50-percent modulation, 1,000 cps. Adjust controls on oscilloscope for a stationary pattern of a few cycles of a sine wave. Slowly adjust "MOD. LEVEL" control of signal gen to increase modulation to 100 percent, noting waveshape on oscilloscope.	Same as paragraph 6-4.	Very definite clipping on the pos and neg peaks at 100-percent modulation. Clipping starts at about 70-percent modulation. (See figure 4-31.)	Check V305. See Table 6-2, step No. 31.
12. Audio power output.	This test is the same as step No. 9, Table 5-2.					See Table 6-2 steps No. 8, 9, and 10.

Continued on next page.

TABLE 6-1. MINIMUM PERFORMANCE STANDARDS (CONT)

Check or Adjustment	Test Equipment Required	Test Equipment Connections	Test Equipment Control Settings	Receiver Control Settings	Minimum Performance	Localization of Trouble
13. "A. F. GAIN" control attenuation.	Same as for sensitivity check.	Same as for sensitivity check.	Set the signal gen for 1 V output, 30 percent modulation 1,000 cps. Set multimeter on 3 V AC range.	"A. F. GAIN" control in extreme counterclockwise position. All other controls as per paragraph 6-4.	Audio power across the "MUTING" terminals less than 1 mw (0.78 V).	Check "A. F. GAIN" control R327.
14. Distortion.	Hewlett-Packard Signal Gen Model 608A. Hewlett-Packard Distortion Analyzer Model 330B.	Connect signal gen to "ANT INPUT" jack J401. Connect "AF INPUT terminals of distortion analyzer to the "MUTING" terminals on rear of receiver.	Signal gen: For 100-uv measurement, set controls for 30-percent modulation, 1000 cps. For 100,000 uv measurement, set controls for 70-percent modulation, 1,000 cps. Distortion Analyzer: 1. Output measurement: a. Set amplifier switch to "METER" position. b. Set voltmeter switch to "30" position and adjust "A. F. GAIN" control on receiver for reading of 0 db on analyzer meter (1 watt). 2. Distortion measurements: a. Set amplifier switch (labeled METER-DISTORTION-SET LEVEL-NOISE) to "SET	Set "A. F. GAIN" control for 1-w output with 100-uv input. Then set the "A. F. GAIN" control for 1-w output with 100,000-uv input.	At 100-uv input, 30-percent modulation, 1,000 cps, total harmonic distortion should not exceed 5 percent. At 100,000 uv input, 70-percent modulation, 1,000 cps, total harmonic distortion should not exceed 15 percent.	Check audio interstage coupling and cathode capacitors for open or short circuit.

Continued on next page.

TABLE 6-1. MINIMUM PERFORMANCE STANDARDS (CONT)

Check or Adjustment	Test Equipment Required	Test Equipment Connections	Test Equipment Control Settings	Receiver Control Settings	Minimum Performance	Localization of Trouble
14. Distortion (cont).			LEVEL" position. b. Set "R. M. S. VOLTS-DB" switch to 100% position. c. Set "AF-RF" switch to "AF" position. d. Slowly turn "INPUT" control clockwise until meter reads exactly full scale (1. 0). e. Set "RANGE" switch to "x10". f. Set amplifier switch to "DISTORTION". g. Set "FREQUENCY" control for reading of "100" on the tuning dial. The meter reading will fall off. h. Tune "BALANCE control and "FREQUENCY" vernier until min meter reading is obtained. Tuning becomes sharper as the meter reading decreases. Repeat the tuning of these two controls until no further meter reduction can be obtained. Keep decreasing setting of voltmeter switch as			

Continued on next page.

TABLE 6-1. MINIMUM PERFORMANCE STANDARDS (CONT)

Check or Adjustment	Test Equipment Required	Test Equipment Connections	Test Equipment Control Settings	Receiver Control Settings	Minimum Performance	Localization of Trouble
14. Distortion (cont).			necessary to have large meter deflections. h. Read distortion directly in percentage. For example if the meter reads 1.5 with the voltmeter switch in the 3% position, the distortion is 1.5 percent.			
15. Power supply signals.	Same as for distortion check. Can sub Triplett Multimeter Model 630-A for distortion analyzer.	Same as for Distortion check.	Set signal gen for 1,000-uv output, no modulation. Set amplifier switch on distortion analyzer to "METER" position. Set voltmeter switch to the "1.0" position.	"A. F. GAIN" control at extreme clockwise position.	Less than 0.16 V on distortion analyzer meter.	C347 or C348 open or leaky.
16. Audio frequency response.	Hewlett-Packard Signal Gen Model 608A. Hewlett-Packard Audio Osc Model 200. Hewlett-Packard Distortion Analyzer Model 330B or Triplett Multimeter Model 630-A	Connect the signal gen to "ANT. INPUT" jack J401. Connect output terminals of audio osc to "EXT. MOD." terminals of signal gen. Connect the distortion analyzer (or multimeter) to "MUTING" terminals on rear of receiver.	Feed a 100-uv signal from the signal gen into the receiver. Set signal gen modulation control on "EXT. MOD." Modulate the signal gen 30 percent with the audio osc. Set amplifier switch on distortion analyzer to "METER" position. Set voltmeter switch to the "30"	As per paragraph 6-2. Set "A. F. GAIN" control for 1-w (24.5 V or O DB) output at 1,000 cps modulation.	Taking 1,000 cps as the reference level (0 db) the output shall be attenuated less than 5 db from 400 to 3,000 cps. The attenuation below 200 cps and above 5,000 cps shall be greater than 10 db.	Check C356 for open or short-circuit, L306 for shorted turns, C355 for open-circuit, T308 for defect. (replace with spare).

Continued on next page.

TABLE 6-1. MINIMUM PERFORMANCE STANDARDS (CONT)

Check or Adjustment	Test Equipment Required	Test Equipment Connections	Test Equipment Control Settings	Receiver Control Settings	Minimum Performance	Localization of Trouble
16. Audio frequency response (cont).			position. Note meter readings on DB scale of output meter at audio freq of 200, 400, 1,000, 3,000 and 5,000 cps.			
17. Maximum noise output.	Triplett Multimeter Model 630-A. 51-ohm, 1/2-w, composition resistor.	Connect multimeter to "MUTING" terminals on rear or receiver. Use multimeter "OUTPUT" and "COMMON" jacks. Connect resistor across "ANT. INPUT" jack J401.	Set multimeter on 12 V AC range.	"A. F. GAIN" control in extreme clockwise position. All other controls as per paragraph 6-4.	Less than 7.73 V (100 mw) reading on multimeter.	Check V309 for microphonics.
18. Susceptibility to conducted interference.	Hewlett-Packard Signal Gen Model 608A. Triplett Multimeter Model 630-A.	Connect signal gen to each of the following in turn through a 1000 uf capacitor: Term. No. 1 of E303 (rear of receiver) Term. No. 2 of E303. Term. No. 5. of E303. Center tab of C367 (on "AUDIO OUTPUT" jack J301). Center tab of C368 (on "AUDIO OUTPUT" jack J301).	Adjust signal gen for 1 V output, 30-percent modulation, 1,000 cps. Adjust signal gen for following spurious freq: 40.4 mc Tuned freq-80.8 mc Tuned freq-28.4 mc Reduce output from signal gen at any freq where the squelch opens up. Note signal gen output at squelch threshold level.	"SQUELCH" switch "ON" All other controls as per paragraph 6-4.	Must require at least 1,000-uv signal to cause the squelch to open (any freq except the one to which the receiver is tuned).	Interference from signal into audio output leads: check for open circuit in C336, C339, C357, C358, C359, C360, C361, C362, C367, C368, Check for shorted turns in L308, L309, L310, L311, L312. Interference from signal into power input leads: Check for open circuit or leakage in C345, C346, C363, C364. Check for shorted turns in L313 and

Continued on next page.

TABLE 6-1. MINIMUM PERFORMANCE STANDARDS (CONT)

Check or Adjustment	Test Equipment Required	Test Equipment Connections	Test Equipment Control Settings	Receiver Control Settings	Minimum Performance	Localization of Trouble
18. Susceptibility to conducted interference (cont).		Center tab of C345 (on "POWER" input jack J302) Center tab of C346 (on "POWER" input jack J302).				L314.

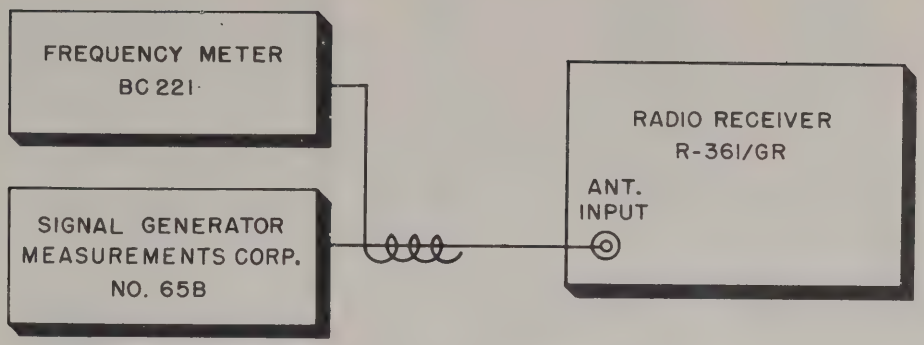

Figure 6-1. Radio Receiver R-361/GR, Recommended Set-Up for Checking Frequency

improper servicing methods and in forestalling future failures.

6-8. RESISTANCE MEASUREMENTS OF POWER CIRCUITS. These measurements, paragraphs 5-11, 5-12, and 5-13, prevent further damage to the equipment from possible short circuits.

6-9. OPERATIONAL TEST. The operation of the receiver (see Table 5-1) is important because it frequently indicates the general location of trouble. In many instances the information gained will determine the exact nature of the fault. In order to utilize this information fully, all symptoms must be interpreted in relation to one another.

6-10. INTERMITTENTS. The possibility of intermittents should not be overlooked. If present, this type of trouble often may be made to appear by tapping or jarring the equipment. The condition can be further aggravated by heating the equipment with an electric heater or by increasing the a-c supply voltage by using a variac between the a-c supply and the input to the equipment. It is possible that the trouble is not in the equipment itself but in the installation, i.e., the mounting, or the trouble may be due to external conditions. In this event, test the installation, if possible.

6-11. SYSTEMS TROUBLE ANALYSIS CHART. (See figures 5-9 and 7-16.) Table 6-2 outlines step-by-

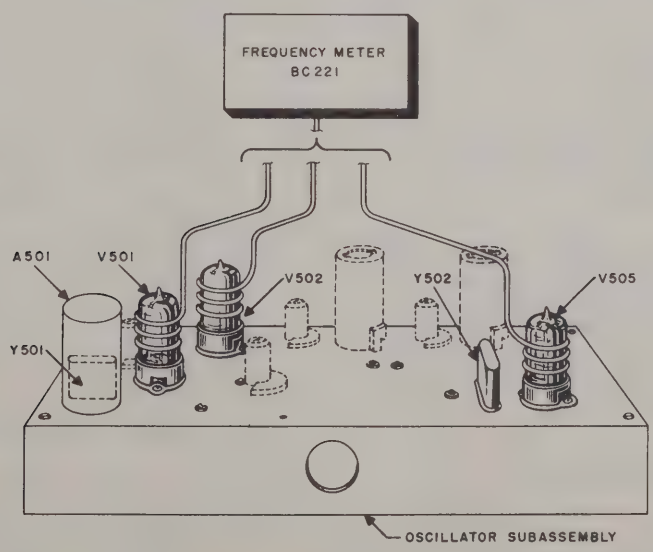

Figure 6-2. Radio Receiver R-361/GR, Recommended Set-Up for Checking Crystals

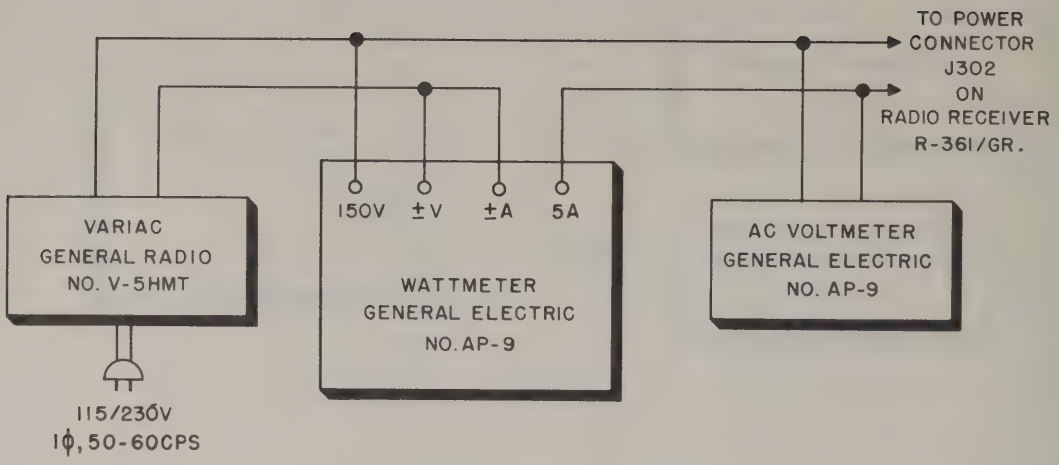

Figure 6-3. Radio Receiver R-361/GR, Recommended Test Set-Up for Line Adjustment and Power Measurement

step procedure necessary to determine or isolate a faulty circuit within a component. An encircled capital letter is used to designate a secondary test point. This is an example of a secondary test point (A). An encircled letter and subscript Arabic numeral is used to designate a minor test point. This is an example of a minor test point (A_1).

6-12. For all measurements made in the following SYSTEMS TROUBLE ANALYSIS, TABLE 6-2, a 600-ohm load should be placed across the "MUTING" terminals at the rear of the receiver or a 600-ohm headset inserted in the "AUDIO OUTPUT" jack on the front panel.

CAUTION

Set the "POWER" switch to the "OFF" position before connecting or disconnecting test equipment to or from the receiver.

To use the chart, perform the tests in the sequence indicated. Trouble within a section is isolated to a particular stage or circuit by noting if normal or abnormal indications are secured and analyzing the results. After the trouble has been isolated, further aid may be obtained from the Tube Socket Voltage and Resistance Chart, Table 6-3.

6-13. REMOVAL OF SUBASSEMBLIES.

6-14. Detailed information on removal of the oscillator and r-f subassemblies is given in paragraphs 5-16 through 5-19. Figure 5-11 illustrates the parts to be disconnected before removing these sections.

6-15. CIRCUIT BREAKDOWN.

6-16. A detailed circuit breakdown according to function is given in paragraphs 4-1 through 4-5 under "General Systems Operation". The circuits described are as follows:

a. R-f section and 1st mixer.
b. First oscillator and multiplier chain.
c. Second oscillator.
d. First i-f, 40.4 mc, and 2nd mixer.
e. Second 6-mc i-f.
f. Second detector and noise limiter.
g. First audio amplifier.
h. Second audio amplifier and power output.
i. Squelch.
j. Automatic volume control.
k. Power supply.

6-17. TUBE SOCKET VOLTAGE AND RESISTANCE CHART. (See figures 7-3 and 7-4.)

6-18. All voltage measurements are made under the following conditions:

a. The voltage supply at 115 V at 60 cps.
b. No r-f signal input.
c. The "AUDIO QUIETING DB" control in the extreme counterclockwise position.
d. The "R.F. GAIN" control in the extreme counterclockwise position.
e. The "SQUELCH" switch in the "OFF" position.
f. The "NOISE LIMITER SWITCH" in the "ON" position.
g. The "A.F. GAIN" control in the extreme counterclockwise position.
h. All voltages measured with a vtvm.
i. All voltages d-c except where noted.
j. All voltages measured with respect to ground, except for the filaments on V311 and V312.

TABLE 6-2. SYSTEMS TROUBLE ANALYSIS

Step	Test Points	Test Equipment Control Positions	Radio Receiver R-361/GR Control Positions	Normal Indication	Possible Cause of Abnormal Indication
POWER INPUT CIRCUITS					
1. "POWER ON" indicator lamp.	(A) Pilot lamp E301.	None required.	Set "POWER" switch to "ON" position.	Pilot lamp E301 lights. If indication normal, proceed with step No. 4.	Pilot lamp dimmer closed; rotate dimmer to max counterclockwise position. Burned out pilot light. Burned out fuse F301. Check jumpers in primary of T307 as per figure 7-1.
2. "POWER" switch.	(A_1) Output side "POWER" switch S301. Black lead and jct gray lead, F301	Set controls on Triplett Multimeter Model 630-A for 300 V AC range. Connect across test points.	Set "POWER" switch to "ON" position.	115 or 230 V reading on the multimeter.	Faulty switch S301. Open choke L313 or L314. C345, C346, C363 or C364 shorted. See paragraph 5-11.
3. "POWER" input jack J302.	(B) Same as ✱1✱.	Set multimeter as in step No. 2. Connect across test point (B).	Set "POWER" switch to "OFF."	115 or 230 V reading on the multimeter.	Check connectors both ends of Power Cable Assembly CX-1541/U.
HIGH VOLTAGE (B+)					
4. Rectifier tubes.	(A_2) Filaments of rectifier tubes V311 and V312.	None required.	Set "POWER" switch to "ON." Set "R. F. GAIN," "A. F. GAIN" and "AUDIO QUIETING DB" controls at extreme counterclockwise position.	Filaments of rectifier tubes V311 and V312 light up.	Open filament winding (term. Nos. 8 and 9 on T307). Faulty connections at above terminals.
5. B+ for r-f and oscillator subassemblies.	(C) Center tab of C429, r-f subassembly.	Set controls on Triplett Multimeter Model 630-A for 300 V DC range. Connect between test point and gnd.	Same as step No. 4	205 V reading on multimeter.	Poor connection between C429 and L305. If indication normal, skip step No. 7.
6. B+ for 2nd mixer, 1st i-f, 2nd i-f.	(D) Term. on R341 furthest from chassis.	Set multimeter as in step No. 5. Connect between test point (D) and gnd.	Same as step No. 4.	+130 V reading on the multimeter.	Check R341. If indication normal, skip step No. 7.

Continued on next page.

TABLE 6-2. SYSTEMS TROUBLE ANALYSIS (CONT)

Step	Test Points	Test Equipment Control Positions	Radio Receiver R-361/GR Control Positions	Normal Indication	Possible Cause of Abnormal Indication
HIGH VOLTAGE (B+) (CONT)					
7. B+ at input of high voltage filter.	(A3) L305, term. with green-black lead.	Set multimeter as in step No. 5. Connect between test point (A3) and gnd.	Same as step No. 4.	+230 V reading on multimeter.	C347 open or leaky. V311 or V312 defective. Open high voltage secondary on T307, term. Nos. 5, 6 and 7.
AUDIO AMPLIFIER CIRCUITS					
8. Power output stage, V309.	(E) "MUTING" terminals rear of receiver. (F) Pin 1 of power output tube V309.	Connect Hewlett-Packard Audio Osc Model 200 and Hewlett-Packard VTVM Model 410B between test point (F) and gnd. Set controls on vtvm to 30 V AC range. Set audio osc controls for 1000 cps and 10 V reading on vtvm. Set controls on Triplett Multimeter Model 630-A for 30 V AC range and connect across test point (E) using "OUTPUT" and "COMMON" meter jacks.	Set "POWER" switch to "ON."	Approx 25 V reading on multimeter. Stage gain, grid to "MUTING" terminals, approx 2.5:1.	If low, V309 weak. If zero, V309 defective; R345, L306 L311 or L312 open; C336, C339, C355, C357, C358, C359, C360, C361, C362, C367, or C368 shorted.
9. Second audio amplifier V307B.	(E) (G) Pin 7 of 2nd audio amplifier tube V307B.	Set and connect multimeter same as for step No. 8. Connect audio osc and vtvm between test point (G) and gnd. Set vtvm controls for 1 V AC. Set audio osc controls for 1000 cps and 0.47 V on vtvm.	Set "POWER" switch to "ON."	Approx 25 V reading on multimeter. Stage gain, grid to plate, approx 23:1.	If low, V307 weak. If zero, V307 defective; R335, R336, R339 or C335 open.

Continued on next page.

TABLE 6-2. SYSTEMS TROUBLE ANALYSIS (CONT)

Step	Test Points	Test Equipment Control Positions	Radio Receiver R-361/GR Control Positions	Normal Indication	Possible Cause of Abnormal Indication
AUDIO AMPLIFIER CIRCUITS (CONT)					
10. First audio amplifier and squelch quieting, V306.	(E) (H) Same as 3	Set and connect multimeter same as for step No. 8. Connect audio osc and vtvm across voltage divider. (See figure 5-10.) Connect divider tap to test point (H) Set vtvm controls for 1 V AC. Set audio osc controls for 1,000 cps and 0.38 V on vtvm. Input to test point (H) is 0.038V.	Set "POWER" switch to "ON" position. Set "A. F. GAIN" control at extreme clockwise position. Set "SQUELCH" switch to "OFF" position. Set "NOISE LIMITER SWITCH" to "OFF" position. Rotate "AUDIO QUIETING DB" control from extreme clockwise position to extreme counterclockwise position and then back to extreme clockwise position.	Approx 25 V reading on multimeter. Stage gain, grid to plate, approx 13:1. Audio output will decrease as "AUDIO QUIETING DB" control is turned in counterclockwise direction.	If low, tube V306 weak, C329 or C331A open. If zero, V306 defective, open-circuit in C327, C328, C332, R327, R329, R330 or R331. If no variation in output as "AUDIO QUIETING DB" control rotated, check R332 and R333 for open.
I-F AMPLIFIER, SECOND MIXER, SECOND DETECTOR					
11. Third i-f V304 and 2nd detector V305.	(H) (I) Pin 1 of 3rd i-f tube V304.	Set controls on Hewlett-Packard VTVM Model 410B to -3 V DC and connect between test point (H) and gnd. Set Measurements Signal Gen No. 65B as follows: Set for 30-percent modulation at 1,000 cps. Set output attenuator for 150,000 uv. Connect from test point (I) to gnd through a 0.05 uf capacitor (in series with "hot" lead). Tune to 6.0 mc for max output on vtvm.	Set "POWER" switch to "ON." "SQUELCH" and "NOISE LIMITER" switches turned "OFF." Short avc to gnd with a jumper from jct of R342, R343 and C331.	Between 1 and 2 V reading on vtvm.	Tubes V304 and V305 defective. R318, R319, R320, R321, R322 or R323 open. C323, C324 or C325 shorted. I-f transformer T306 defective.

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TABLE 6-2. SYSTEMS TROUBLE ANALYSIS (CONT)

Step	Test Points	Test Equipment Control Positions	Radio Receiver R-361/GR Control Positions	Normal Indication	Possible Cause of Abnormal Indication
I-F AMPLIFIER SECOND MIXER, SECOND DETECTOR (CONT)					
12. 2nd i-f, V303.	(H) (J) Pin 1 of 2nd i-f tube V303.	Set and connect vtvm same as for step No. 11. Set signal gen as in step No. 11 but set attenuator for approx 15,000 uv. Connect from test point (J) to gnd.	Set "POWER" switch to "ON" position. Rotate "R. F. GAIN" control from extreme clockwise position to extreme counterclockwise position and then back to extreme clockwise position. Short avc to gnd as in step No. 11.	Between 11,000 and 19,000-uv input to get same reading on vtvm noted in step No. 11. Reading on vtvm will decrease as "R. F. GAIN" control turned in counterclockwise direction	If low, tube V303 weak, C313 or C316 open. If zero, V303 defective, R309, R312, R313, or R315 open; C316 shorted. If no variation in output as "R. F. GAIN" control rotated, R309 open. If output too high at max counterclockwise position, R301 open.
13. 1st i-f, V302.	(H) (K) Pin 1 of 1st i-f tube V302.	Set and connect vtvm as per step No. 11. Set signal gen as in step No. 11 but set attenuator for approx 500 uv. Connect from test point (K) to gnd.	Set "POWER" switch to "ON" position. Set "R. F. GAIN" control at extreme clockwise position. Short avc to gnd as in step No. 11.	Between 320 and 680-uv input to get same reading on vtvm noted in step No. 11.	If low, tube V302 weak, T304 defective, or C309 open. If zero, R307, R308 or R310 open.
14. 2nd mixer, V301.	(H) (L) Same as 5	Set and connect vtvm as per step No. 11. Set signal gen as in step No. 11 but set attenuator for approx 600 uv. Connect from test point (L) to gnd.	Same as step No. 13. Short avc to gnd as in step No. 11.	Between 390 and 810-uv input to get same reading on vtvm noted in step No. 11.	If low, tube V301 weak or T303 misaligned. If zero, tube V301 defective; R304 or R305 open; C306 shorted; T303 defective. If L307 or C302 open, will get excessive gain.
OSCILLATOR SUBASSEMBLY					
15. 1st oscillator, V501.	(M) "1st TRIPL METER" jack J501.	Set controls on Hewlett-Packard VTVM Model 410B for -1 V DC range. Connect from test point to gnd.	Set "POWER" switch to "ON" position.	Approx 1 V reading on the vtvm. Will vary with freq. activity of individual crystal (Y501), and change in tube V501.	Defective crystal Y501 or tube V501. R501, R502, R503, R504, R505, or R506 open. C501 shorted. C505, C506 or C507 defective (may be either open or shorted) "1st OSC" C501 misaligned.

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TABLE 6-2. SYSTEMS TROUBLE ANALYSIS (CONT)

Step	Test Points	Test Equipment Control Positions	Radio Receiver R-361/GR Control Positions	Normal Indication	Possible Cause of Abnormal Indication
OSCILLATOR SUBASSEMBLY (CONT)					
16. Crystal oven A501.	(A4) Pin 3 of xtal socket for Y501.	Set controls on Triplett Multimeter Model 630-A for 12 V AC range. Connect between test point and gnd.	Set "POWER" switch to "ON" position.	Intermittent 6.3 V reading on multimeter as thermostat in oven opens and closes.	Open line from pin No. 3 on crystal oven socket X506 to L516. Defective thermostat in A501
17. 1st tripler V501.	(N) "1st AMPL METER" jack J502.	Set controls on Hewlett-Packard VTVM Model 410B for -1 V DC range. Connect from test point to gnd.	Set "POWER" switch to "ON" position.	Approx 1.5 V reading on the vtvm. Will vary with freq, activity of individual crystal (Y501) and change in tube V501.	C513, R507, R508 or R509 open. C502 shorted. C508 or C512 defective (may be either open or shorted). "1st TRIPL PLATE" C502 misaligned.
18. 1st amplifier V502.	(O) "2nd TRIPL METER" jack J503.	Set controls on Hewlett-Packard VTVM Model 410B for -3 V DC range. Connect from test point to gnd.	Set "POWER" switch to "ON" position.	Approx 3 V reading on the vtvm. Will vary with freq, drive from 1st oscillator-1st tripler stage, and change in tube V502.	Tube V502 defective. R510, R511, R512 or R526 open. C503 shorted (rotor plates touching stator plates). C510 shorted if no indication of tuning but high reading; C510 open if no reading. C514 or C538 defective (may be either open or shorted).
19. 2nd tripler V503.	(P) "2nd AMPL METER" jack J504.	Set controls on Hewlett-Packard VTVM Model 410B for -1 V DC range. Connect from test point to gnd.	Set "POWER" switch to "ON" position.	Approx 1 V reading on the vtvm. Will vary with freq, drive from 1st amplifier stage, and change in tube V503.	Tube V503 defective. L508, L511, R513, R514, R515 or R516 open. U501 shorted (rotor plates touching stator plates or capacitor touching silver-plated strap inductor). C516, C518 or C519 defective (may be either open or shorted.

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TABLE 6-2. SYSTEMS TROUBLE ANALYSIS (CONT)

Step	Test Points	Test Equipment Control Positions	Radio Receiver R-361/GR Control Positions	Normal Indication	Possible Cause of Abnormal Indication
OSCILLATOR SUBASSEMBLY (CONT)					
20. 2nd amplifier, V504.	(Q) Same as 7.	Set controls on Hewlett-Packard VTVM Model 410B for 3 V AC range. Connect from test point to gnd. Use gnd lead on side of test probe.	Set "POWER" switch to "ON" position.	Approx 1.5 V reading on the vtvm. Will vary with freq, drive from 2nd tripler stage, and change in tube V504.	Tube V504 defective. L509 L512, R518, R519 or R520 open. C520, C522, C523, or C524 shorted. U502 shorted (rotor plates touching stator plates or capacitor touching silver-plated strap inductor). C525 or C427 defective (may be either open or shorted).
21. 2nd oscillator, V505.	(R) Same as 6.	Set selector switches on Hewlett-Packard VTVM Model 410B for -10 V DC range. Connect from test point to gnd. Use a 1-meg resistor on end of vtvm probe.	Set "POWER" switch to "ON" position.	4-10 V reading on the vtvm. Will vary with activity of crystal Y502 and change in tube V505.	Defective crystal Y502 or tube V505. C303, C504, E501, L504, L507, R517, R521, R522, R523, R524 or R525 open. C528 shorted. C527, C528 or C535 defective (may be either open or shorted).
R-F SUBASSEMBLY					
22. 1st mixer, V404.	(H) (S) Same as 8.	Set a Hewlett-Packard Signal Gen Model 608A as follows: Set for 30-percent modulation at 1000 cps. Set tuning control for desired r-f freq. Set attenuator control for 3 uv. Connect from test point (S) to gnd. Set controls on Hewlett-Packard VTVM Model 410B for -3 V DC range. Connect from test point (H) to gnd.	Set "POWER" switch to "ON" position. Set "R. F. GAIN" control at extreme clockwise position. Set "SQUELCH" switch to "OFF" position.	2.6 V reading on the vtvm. If indication normal, proceed with step No. 27.	Tube V404 defective. T301 defective or misaligned. C301, C425, R413, R416 or R418 open. C425, C426 or C431 shorted.

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TABLE 6-2. SYSTEMS TROUBLE ANALYSIS (CONT)

Step	Test Points	Test Equipment Control Positions	Radio Receiver R-361/GR Control Positions	Normal Indication	Possible Cause of Abnormal Indication
R-F SUBASSEMBLY (CONT)					
23. 3rd r-f V403.	(S) (T) Pin 1 of 1st mixer tube V404.	Set selector switches on Hewlett-Packard VTVM Model 410B for 3V AC range. Connect a-c probe to test point (T) . Connect gnd lead, on side of a-c probe, to gnd. Set a Hewlett-Packard Signal Gen Model 608A as follows: "MOD. LEVEL" control for zero modulation. Set attenuator for 500 mv. Connect to test point (S) . Set tuning control for desired r-f freq. Tune for max reading on vtvm.	Set "POWER" switch to "ON" position.	Reading on vtvm will vary from as low as 0.6 V at 225 mc to as high as 2.8 V at 399.9 mc.	If low, tube V403 weak, "3rd RF PLATE" U404 misaligned, C421 open. If high, C433 or R420 open; C415 or C416 shorted. If zero, tube V403 defective, "3rd RF PLATE" U404 misaligned, U404 shorted (rotor plates touching stator plates or capacitor touching silver-plated strap inductor), C423 open or shorted, C421 or C433 shorted; L403, R409, R410, R411 or R414 open.
24. 2nd r-f V402.	(S) (U) Pin 1 of 3rd r-f tube V403.	Set and connect vtvm to test point (U) as for step No. 23. Set and connect signal gen as for step No. 23.	Same as step No. 23.	Readings on vtvm will vary from as high as 3.1 V at 225 mc to as low as 1.4V at 399.9 mc.	If low, tube V402 weak, "2nd RF PLATE" U403 misaligned, C409 open. If high, C409 shorted or C413 open. If zero, U403 shorted (rotor plates touching stator plates or capacitor touching silver-plated strap inductor), C413 shorted; C412, C414, L402, R406 or R407 open.

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TABLE 6-2. SYSTEMS TROUBLE ANALYSIS (CONT)

Step	Test Points	Test Equipment Control Positions	Radio Receiver R-361/GR Control Positions	Normal Indication	Possible Cause of Abnormal Indication
R-F SUBASSEMBLY (CONT)					
25. 1st r-f V401.	(S) (V) Pin 2 of 2nd r-f tube V402.	Set and connect vtvm to test point (V) as for step No. 23. Set and connect signal gen as for step No. 23.	Same as step No. 23.	Readings on vtvm will vary from as high as 2.0 V at 225 mc to as low as 0.9 V at 399.9 mc.	If low, tube V401 weak, "1st RF PLATE" U402 misaligned, C402 open. If high, C402 shorted. If zero, U402 shorted (rotor plates touching stator plates or capacitor touching silver-plated strap inductor), C406 open. C406 shorted; C407, L401, R403 or R404 open.
26. Antenna Input.	(S) (W) Pin 2 of 1st r-f tube V401.	Set and connect vtvm to test point (W) as for step No. 23. Set and connect signal gen as for step No. 23.	Same as step No. 23.	Approx 0.3 V reading on vtvm.	Poor connection at "ANT. INPUT" jack J401, C403 open or shorted, "ANT." U401 misaligned, U401 shorted (rotor plates touching stator plates or capacitor touching silver-plated strap inductor).
AVC CIRCUITS					
27. AVC bus.	(S) (X) "AVC METER" jack J303.	Set selector switches on Hewlett-Packard VTVM Model 410B for -10V DC range. Connect from test point (X) to gnd. Set Hewlett-Packard Signal Gen Model 608A as follows: Set for 30-percent modulation at 1000 cps. Set tuning control for desired r-f frequency. Set attenuator for 5 uv. Connect to test point (S). Tune signal gen for max output on vtvm.	Same as step No. 13.	Reading on vtvm will vary from as low as 1.5 V at 225 mc to as high as 3.1 V at 399.9 mc. If indication normal, proceed with step No. 29.	If low, C302, C307, C312 or C420 shorted. If zero, C331B or C333 shorted; J303, R342, R343 or R356 open.

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TABLE 6-2. SYSTEMS TROUBLE ANALYSIS (CONT)

Step	Test Points	Test Equipment Control Positions	Radio Receiver R-361/GR Control Positions	Normal Indication	Possible Cause of Abnormal Indication
AVC CIRCUITS (CONT)					
28. AVC detector output.	(S) (A5) Jct C344 and R353.	Set selector switches on Hewlett-Packard VTVM Model 410B for -3 V DC range. Connect from test point (A5) to gnd. Set and connect signal gen as in step No. 27.	Same as step No. 13.	Readings on vtvm will vary from as low as 1.9 V at 225 mc to as high as 4.2 V at 399.9 mc	Tube V308 defective, T302 defective or misaligned, C344 open or shorted, R353 open. See step No. 29.
29. AVC delay voltage.	(A6) Jct R349, R350, R354.	Set selector switches on Hewlett-Packard VTVM Model 410B for 30 V DC range. Connect from test point to gnd.	Same as step No. 13.	12.5 V reading on vtvm.	Tube V310 or T302 defective. C341, C342, C343 or C354 shorted. R349, R350, R351, R352 or R354 open.
SQUELCH AND NOISE LIMITER CIRCUITS					
30. Squelch circuit.	(S) (A7) Pin 2 of squelch amplifier tube V307A.	Set vtvm as in step No. 28 and connect to test point (A7) Set signal gen as in step No. 27 and connect to test point (S)	Set "POWER" switch to "ON" position. Plug 600 ohm head set into "AUDIO OUTPUT" jack J301. Set "SQUELCH" switch to "ON" position. Set "R. F. GAIN" control at extreme counterclockwise position and then rotate clockwise until signal "pops" into headphones. Note reading on vtvm.	Between 0.6 and 1.2 V reading on vtvm at threshold point.	Tubes V307, V308 or "SQUELCH" switch defective. C334 shorted. R337, R338 or R340 open. No avc voltage; see step No. 27.

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TABLE 6-2. SYSTEMS TROUBLE ANALYSIS (CONT)

Step	Test Points	Test Equipment Control Positions	Radio Receiver R-361/GR Control Positions	Normal Indication	Possible Cause of Abnormal Indication
SQUELCH AND NOISE LIMITER CIRCUITS (CONT)					
31. Noise Limiter.	(S) (A8) Same as 3	Set and connect signal gen as in step No. 27. Connect the vert amplifier of a Dumont No. 304 Oscilloscope from test point (A8) to gnd. Adjust controls for a stationary pattern. Slowly increase modulation on signal gen to 100 percent, noting waveshape on oscilloscope.	Set "POWER" switch to "ON" position. Set "R. F. GAIN" control so squelch operates at 5 uv. Set "NOISE LIMITER SWITCH" to "ON" position. Reset "SQUELCH" switch to "OFF" position.	Very definite clipping on the pos and neg peaks at 100-percent modulation. Clipping starts at about 70 percent modulation. (See figure 7-15.)	Tube V305 or "NOISE LIMITER SWITCH" defective. R324 or R325 open. C326 open or shorted. R322 wrong value; no clipping if too low.

TABLE 6-3. TUBE SOCKET VOLTAGES AND RESISTANCES

Tube Number	Pin Number	Voltage	Resistance (Ohms) to Ground
V401 (6J4)	1	-0.1	310K
	2	1.0	100
	3	0.0	0.0
	4	6.3 a-c	0.0
	5	-0.1	310K
	6	-0.1	310K
	7	123	23K
V402 (6J4)	1	-0.1	310K
	2	1.2	100
	3	0.0	0.0
	4	6.3 a-c	0.0
	5	-0.1	310K
	6	-0.1	310K
	7	121	23K
V403 (6AK5W)	1	-0.1	410K
	2	1.0	220
	3	6.3 a-c	0.0
	4	0.0	0.0
	5	112	24K
	6	65	71K
	7	1.0	220
V404 (6AK5W)	1	0.0	0.0
	2	3.2	680
	3	0.0	0.0
	4	6.3 a-c	0.0
	5	106	25K
	6	106	25K
	7	3.2	680
V501 (12AT7)	1	190	21K
	2	-7.5	54K
	3	1.9	110
	4	0.0	0.0
	5	0.0	0.0
	6	190	21K
	7	0.0	0.0
	8	1.9	110
	9	6.3 a-c	0.0
V502 (6AG5)	1	*-5.3	29K
	2	0.0	0.0
	3	6.3 a-c	0.0
	4	0.0	0.0
	5	182	21K
	6	122	68K
	7	0.0	0.0
V503 (6AK5W)	1	*-15	54K
	2	0.0	0.0
	3	6.3 a-c	0.0
	4	0.0	0.0
	5	175	22K
	6	96	69K
	7	0.0	0.0
V504 (6AK5W)	1	*-2.0	29K
	2	0.8	100
	3	6.3 a-c	0.0
	4	0.0	0.0
	5	175	22K
	6	95	69K
	7	0.8	100
V505 (12AT7)	1	180	21K
	2	*-3.0	27K
	3	1.9	135
	4	0.0	0.0
	5	0.0	0.0
	6	173	22K
	7	0.0	0.0
	8	1.9	135
	9	6.3 a-c	0.0
V301 (6BF6)	1	**-5.0	27K
	2	2.3	220
	3	0.0	0.0
	4	6.3 a-c	0.0
	5	108	22K
	6	108	22K
	7	-0.1	300K
V302 (6BA6)	1	-0.1	300K
	2	26	6800
	3	0.0	0.0
	4	6.3 a-c	0.0
	5	155	21K
	6	155	21K
	7	26	6900
V303 (6BA6)	1	-0.1	400K
	2	26	6800
	3	0.0	0.0
	4	6.3 a-c	0.0
	5	155	21K
	6	155	21K
	7	26	6900
V304 (6BA6)	1	-0.02	240K
	2	1.3	150
	3	0.0	0.0
	4	6.3 a-c	0.0
	5	180	20K
	6	88	59K
	7	1.6	180
V305 (6AL5W)	1	0.0	0.0
	2	-0.2	47K
	3	0.0	0.0
	4	6.3 a-c	0.0
	5	0.3	750K
	6	0.0	0.0
	7	-0.4	150K

Continued on next page

* Approximate voltage. Actual value dependent on crystal activity, mutual conductance of V501, V502, V503, V505 and channel (frequency) used.

** Approximate voltage. Actual value dependent on activity of crystal Y502 and mutual conduction of V505.

TABLE 6-3. TUBE SOCKET VOLTAGES AND RESISTANCES (CONT)

Tube Number	Pin Number	Voltage	Resistance (Ohms) to Ground
V306 (12AX7)	1	90	340K
	2	60	480K
	3	61	13K
	4	0.0	0.0
	5	0.0	0.0
	6	90	340K
	7	0.0	200
	8	1.1	4700
	9	6.3 a-c	0.0
V307 (12AX7)	1	60	8700
	2	-0.6	1.2 meg
	3	0.0	0.0
	4	0.0	0.0
	5	0.0	0.0
	6	110	160K
	7	0.0	470K
	8	1.0	2200
	9	6.3 a-c	0.0
V308 (6AL5W)	1	61	8700
	2	-0.04	87K
	3	0.0	0.0
	4	6.3 a-c	0.0
	5	12.5	1500
	6	0.0	0.0
	7	60	8700
V309 (6AQ5)	1	0.0	470K
	2	10	280
	3	0.0	0.0
	4	6.3 a-c	0.0
	5	192	19K
	6	200	19K
	7	0.0	470K
V310 (6AU6)	1	12.2	470K
	2	0.0	0.0
	3	6.3 a-c	0.0
	4	0.0	0.0
	5	190	20K
	6	120	47K
	7	13.1	1600
V311 (5Y3GT)	1	**NC	**NC
	Between 2 & 8	5.0 a-c	---
	2	225	19K
	3	**NC	**NC
	4	230 a-c	20
	5	**NC	**NC
	6	230 a-c	20
	7	**NC	**NC
	8	225	19K
V312 (5Y3GT)	1	**NC	**NC
	Between 2 & 8	5.0 a-c	---
	2	225	19K
	3	**NC	**NC
	4	230 a-c	20
	5	**NC	**NC
	6	230 a-c	20
	7	**NC	**NC
	8	225	19K

**NC No connection

6-19. ALIGNMENT.

6-20. Table 6-4 gives instructions necessary to align the receiver after repairs have been completed. (See figures 1-3, 1-4 and 6-4.)

TABLE 6-4. ALIGNMENT

CIRCUIT	CONNECTIONS	TUNING PROCEDURES
6 mc i-f	1. Short avc to gnd at jct of R342, R343, and C331. 2. Connect a d-c vtvm at jct of R325 and S303. 3. Set "R.F. GAIN" control to extreme clockwise position. 4. Zero beat a Measurements Signal Generator No. 65B to a BC221 freq meter tuned to 6.0 mc. Connect the signal gen to center-tab of C351. Adjust the output control to get a nominal output on the vtvm.	1. T303: a. Solder a 680-ohm resistor across the primary. b. Tune the secondary slug (on top of shield can) for max indication on the vtvm. c. Remove the 680 ohm resistor. d. Solder a 680 ohm resistor across the secondary. e. Tune the primary slug (on bottom of chassis) for max indication on the vtvm. f. Remove the 680-ohm resistor.

Continued on next page

TABLE 6-4. ALIGNMENT (CONT)

CIRCUIT	CONNECTIONS	TUNING PROCEDURES
6 mc i-f (cont).		2. T304: Repeat the procedure in steps 1 a through f above. 3. T305: Repeat the procedure in steps 1 a through f above. 4. T306: Repeat the procedure in steps 1 a through f above.
AVC.	1. Remove the avc short and insert the vtvm probe in "AVC METER" jack J303. 2. The signal gen remains as above.	1. Tune the slug on T302 (on bottom of chassis) for max indication on the vtvm.
Second oscillator.	1. Place a 1-meg 1/2-w carbon resistor in series with vtvm probe. Connect other end of resistor to pin 1 of V301.	1. Tune the "2nd OSC TUNING" for a max indication on the vtvm.
First oscillator.	See TUNING PROCEDURES, in next column.	1. Set all the tuning dials to approx the correct freq. (See figure 1-3.) 2. Remove resistor from probe and connect vtvm to: a. The "1st TRIPL METER" jack J501 and tune the "1st OSC" adjustment for a peak in the meter. b. The "1st AMPL METER" jack J502 and tune the "1st TRIPL PLATE" adjustment for a peak in the meter. c. The "2nd TRIPL METER" jack J503 and tune the "1st AMPL PLATE" adjustment for a peak in the meter. d. The "2nd AMPL METER" jack J504 and tune the "2nd TRIPL PLATE" adjustment for a peak in the meter. e. Set the "2nd AMPL PLATE" adjustment to the desired freq on the scale.
RF.	1. Connect a vtvm at jct of R325 and S303. 2. Connect signal gen to "ANT. INPUT" jack. Adjust the output control to get a nominal output on the vtvm.	1. "Rock" the signal gen freq dial for a max indication on the vtvm. 2. Adjust the "ANT.", "1st RF PLATE," "2nd RF PLATE," and "3rd RF PLATE" tuning adjustments to the approx desired freq. (See figure 1-3.) 3. Make a final adjustment on the above four controls as well as the others indicated, by noting a peak on the meter, in the order given: a. "2nd AMPL PLATE." b. "ANT." c. "1st RF PLATE." d. "2nd RF PLATE." e. "3rd RF PLATE." f. T301 (top slug). g. T301 (bottom slug). h. L307 (bottom slug). i. Repeat steps 3 a through h.

6-21. MAINTENANCE AND INSPECTION SCHEDULE.

6-22. Preventive maintenance should be performed at the intervals indicated in Table 6-5, unless these intervals are reduced by the local commander. This is in addition to the Inspection Schedule of Table 5-4.

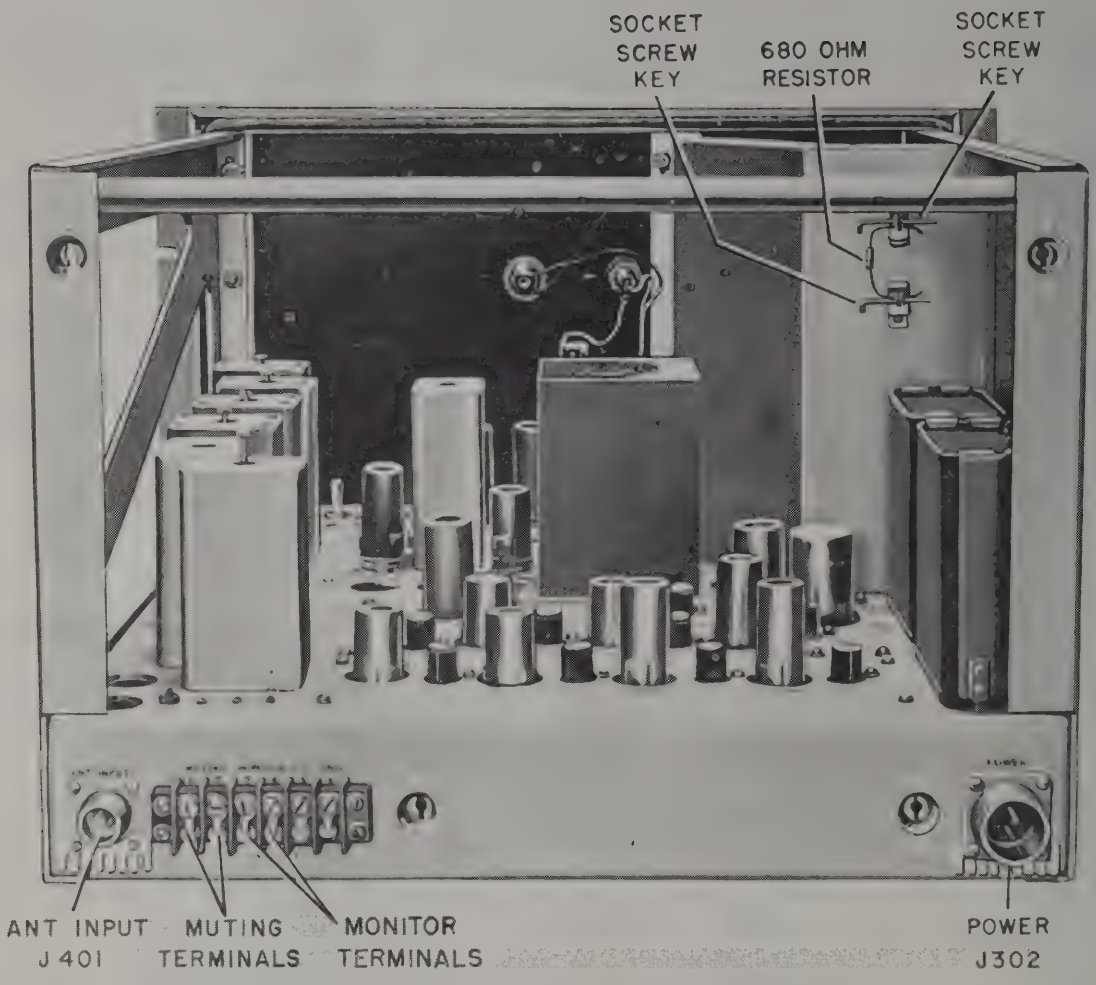


Figure 6-4. Radio Receiver R-361/GR, Rear View, Dust Cover Removed

TABLE 6-5. PREVENTIVE MAINTENANCE AND INSPECTION SCHEDULE

COMPONENT	INSPECTION	TIME
Radio Receiver R-361/GR	Check minimum performance as per Table 6-1.	Quarterly
Crystal Oven A501 and Crystal Y501	Check prongs for corrosion.	Quarterly
Radio Receiver R-361/GR	a. Inspect all tubes for cracks in the glass bulb and base and for bent and broken prongs. Clean with carbon tetrachloride; if necessary, clean prongs with crocus cloth. Test tubes with tube tester. b. Inspect fuse ends for evidence of burning, corrosion, and looseness. Clean fuse ends with emery cloth and wipe with clean cloth. c. Make sure pilot lamp base is not loose. d. Carefully clean chassis with a brush or cloth dipped in carbon tetrachloride. e. After the receiver has been thoroughly and carefully cleaned, make visual inspection of parts and wiring for rust, corrosion, loose connections, frayed and burned insulation, loose screws, burned and charred resistors and coils. Check tube sockets for broken contacts, terminal boards for broken lugs and signs of burning. Inspect and tighten all loose control dial setscrews. f. Check "R. F. GAIN" and "A. F. GAIN" controls for unsatisfactory electrical and mechanical operation. g. Check MFP (moisture-fungus proof) coatings for breaks. Retouch with brush if necessary; use TUF-ON-74 MFP varnish or equivalent. h. Check variable capacitors of U401, U402, U403, U404, U501, U502 and C501, C502, C503, for dirt, corrosion and bent plates.	Semi-annually
Antenna Assembly AT-197/GR (figure 1-5)	a. Place anti-seize compound (MIL-C-25681) between contact surfaces of antenna support assembly and antenna coupling assembly. b. Check bead chains which secure 12 lower rods to antenna assembly head for corrosion and breakage. Replace if necessary. c. Check connector at bottom of cable assembly and if necessary refabricate (paragraph 3-27). d. Check joints at bottom and top of glass insulator of antenna cone. If electrical continuity is impaired or joints are defective, refer to applicable Handbook of Overhaul Instructions.	Quarterly

6-23. OVERHAUL SCHEDULE. The nature of the components comprising the receiver are such, that regular overhaul is not required.

6-24. FLIGHT TEST FOR ENTIRE SYSTEM.

6-25. Purpose: To provide proof of equipment performance.

6-26. Scope: The flight test is limited to a technical evaluation of equipment performance and is not intended to provide facility check.

6-27. Applications: Flight test of this equipment is required after initial installation, modification resulting in deviation from original operational standards and after overhaul.

6-28. Conditions:

a. This equipment will meet T. O. specifications with particular emphasis on receiver sensitivity. Receiver sensitivity will be checked prior to and after the completion of the flight test. The variation between the beginning and the end of the flight test will not exceed 1%.

b. Aircraft altitude--maximum.
c. The flight pattern will be radial from the site until loss of communications occurs. Determine maximum range of communications for communications evaluation. This range will not be less than 130 nautical miles.
d. Equipment in aircraft utilized in the flight test will meet T. O. specifications with particular emphasis on transmitter power output. Transmitter power output will be tested prior to and after completion of the flight test. The variation between the beginning and the end of the flight test will not exceed 1%.
e. The activity supporting the aircraft utilized in the flight test will furnish performance figures of transmitter power output of the airborne equipment prior to and after the completion of the flight test, to the activity whose equipment is being flight tested.
f. There will be a minimum of one flight.

6-29. Records:
a. The following data will be recorded on the flight test report:
(1). Organization (facility being tested).
(2). Type of test (after installation, modification or overhaul).
(3). Date of flight test.
(4). Altitude of aircraft at time of test.
(5). Type and serial number of aircraft used in flight test.
(6). Flight number (1st, 2nd, etc.).
(7). Type of airborne equipment used in flight test.
(8). Serial number of airborne equipment.
(9). Type of airborne antenna utilized.
(10). Airborne transmitter power output (prior to and after completion of flight test).
(11). Type of ground antenna utilized.
(12). Ground component serial numbers.
(13). Frequency utilized in flight test.
(14). Ground receiver sensitivity (prior to and after completion of flight test).
(15). Maximum range of communications recorded.
b. One report for each radial flight is required.
c. Completed copies of the flight test report will be prepared at the activity being checked and will be made a permanent part of the facility acceptance records.
d. AFTO form 73 will be utilized in recording the flight test data.

6-30. Procurement of forms:
a. The subject AFTO Form will be procured, as required, in accordance with the procedures contained within Air Force Manual 67-1 for implementation of the test prescribed by this technical order.

6-31. Distribution of forms:
a. Distribution of filled in AFTO Form 73 will be as follows:
(1). One copy to plant in place records.
(2). Two copies to the installation activity.
(3). One copy to the cognizant major command.
(4). One copy to the activity supporting the test aircraft.

6-32. Disposition of forms:
a. AFTO Form 73 will be disposed of as prescribed in AFM 181-5, Chapter 3, Section C, paragraph 126.

GROUND - AIR COMMUNICATIONS FLIGHT TEST REPORT

ORGANIZATION	DATE

TYPE OF TEST

☐ AFTER INSTALLATION ☐ AFTER MODIFICATION ☐ AFTER OVERHAUL

AIRCRAFT

SERIAL NR	TYPE	ALTITUDE ft.	FLIGHT NR

AIRBORNE EQUIPMENT DATA

TYPE	SERIAL NR	ANTENNA TYPE

TRANSMITTER POWER OUTPUT		RECEIVER SENSITIVITY	
WATTS *(Prior to test)*	WATTS *(After test)*	UVOLTS INPUT FOR RATED OUTPUT *(Prior to test)*	UVOLTS INPUT FOR RATED OUTPUT *(After test)*

GROUND EQUIPMENT DATA

COMPONENT TYPES	SERIAL NUMBERS
TRANSMITTER ANTENNA TYPE	RECEIVER ANTENNA TYPE

TRANSMITTER POWER OUTPUT		RECEIVER SENSITIVITY	
WATTS *(Prior to test)*	WATTS *(After test)*	UVOLTS INPUT FOR RATED OUTPUT *(Prior to test)*	UVOLTS INPUT FOR RATED OUTPUT *(After test)*

FLIGHT TEST DATA

FREQUENCY UTILIZED	MAXIMUM RANGE OF COMMUNICATIONS RECORDED ☐ ☐ NAUTICAL MILES

REMARKS

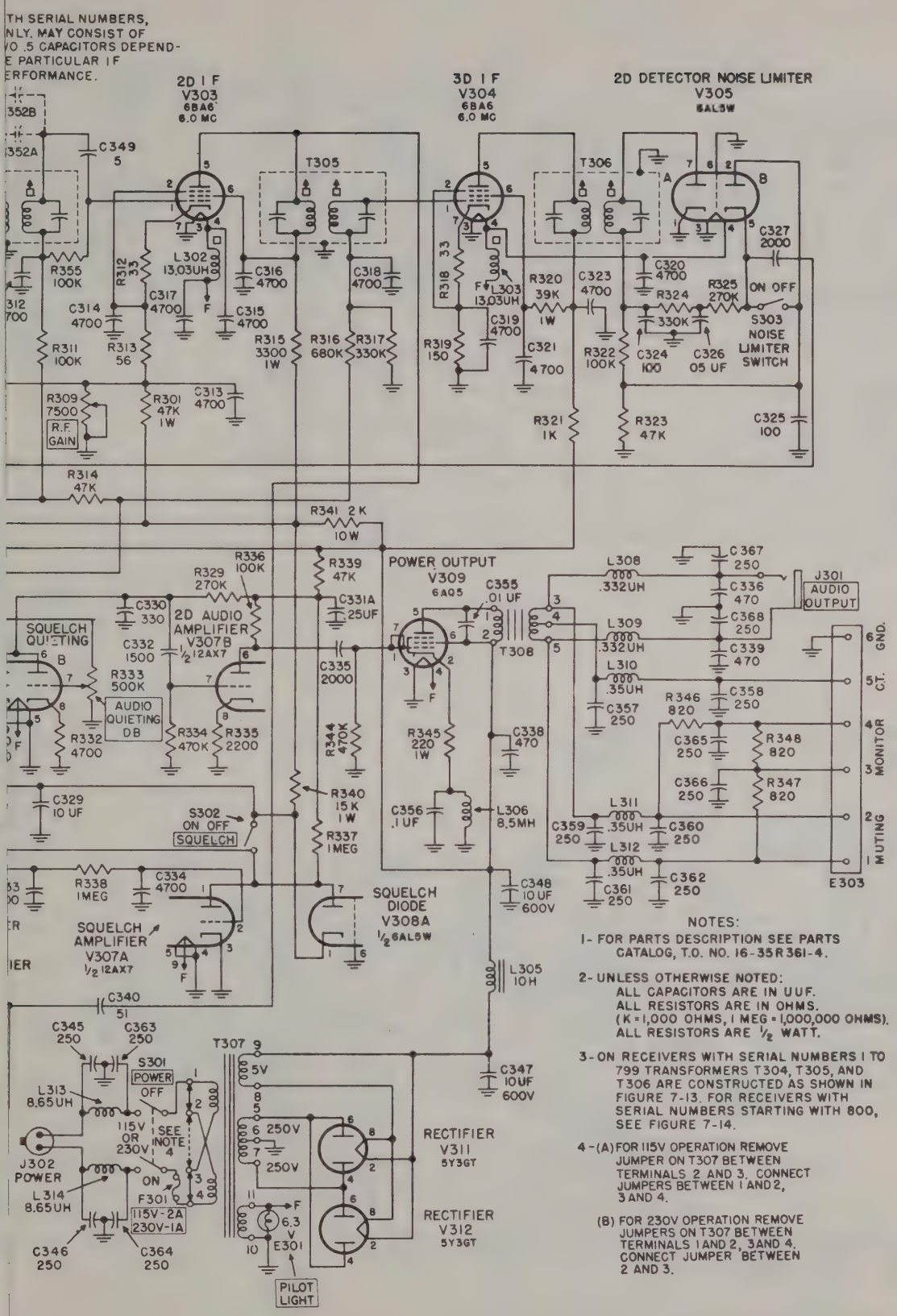
PREPARED BY *(Name & Title)*	SIGNATURE

AFTO FORM 73 15 APR 56

SECTION VII
DIAGRAMS

7–1. GENERAL.

7–2. This section contains schematic and wiring diagrams used as reference material for the text and necessary for the servicing of this equipment. In addition voltage and resistance charts are presented to facilitate trouble shooting. Other information, such as typical response curves and characteristics of various circuits, is included so that factory test conditions can be re-established.



NOTES:

1- FOR PARTS DESCRIPTION SEE PARTS CATALOG, T.O. NO. 16-35R361-4.

2- UNLESS OTHERWISE NOTED:
ALL CAPACITORS ARE IN UUF.
ALL RESISTORS ARE IN OHMS.
(K = 1,000 OHMS, 1 MEG = 1,000,000 OHMS).
ALL RESISTORS ARE ½ WATT.

3- ON RECEIVERS WITH SERIAL NUMBERS 1 TO 799 TRANSFORMERS T304, T305, AND T306 ARE CONSTRUCTED AS SHOWN IN FIGURE 7-13. FOR RECEIVERS WITH SERIAL NUMBERS STARTING WITH 800, SEE FIGURE 7-14.

4-(A) FOR 115V OPERATION REMOVE JUMPER ON T307 BETWEEN TERMINALS 2 AND 3. CONNECT JUMPERS BETWEEN 1 AND 2, 3 AND 4.

(B) FOR 230V OPERATION REMOVE JUMPERS ON T307 BETWEEN TERMINALS 1 AND 2, 3 AND 4. CONNECT JUMPER BETWEEN 2 AND 3.

Figure 7-1. Radio Receiver R-361/GR, Schematic Diagram

SECTION VII
DIAGRAMS

7–1. GENERAL.

7–2. This section contains schematic and wiring diagrams used as reference material for the text and necessary for the servicing of this equipment. In addition voltage and resistance charts are presented to facilitate trouble shooting. Other information, such as typical response curves and characteristics of various circuits, is included so that factory test conditions can be re-established.

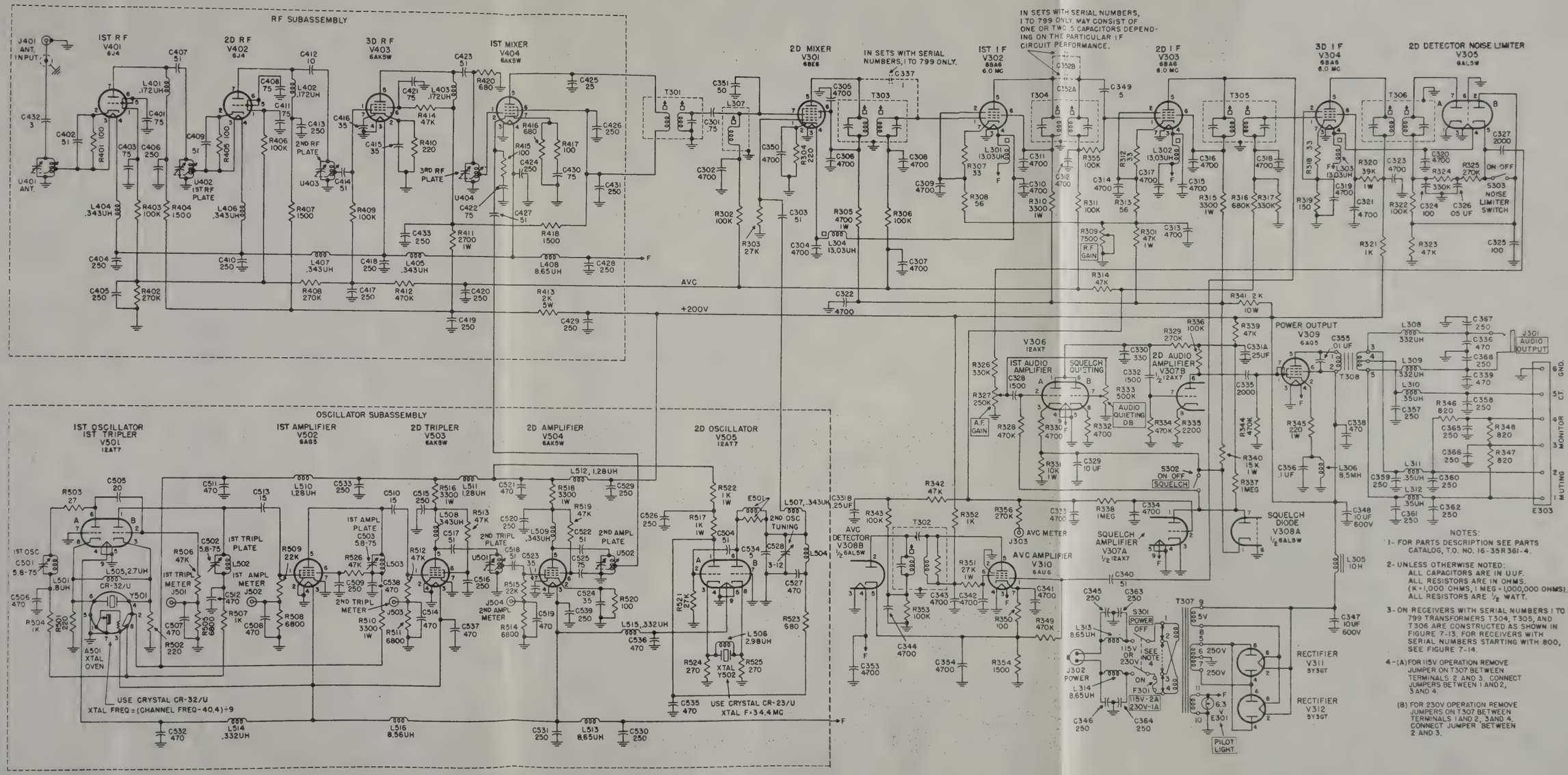
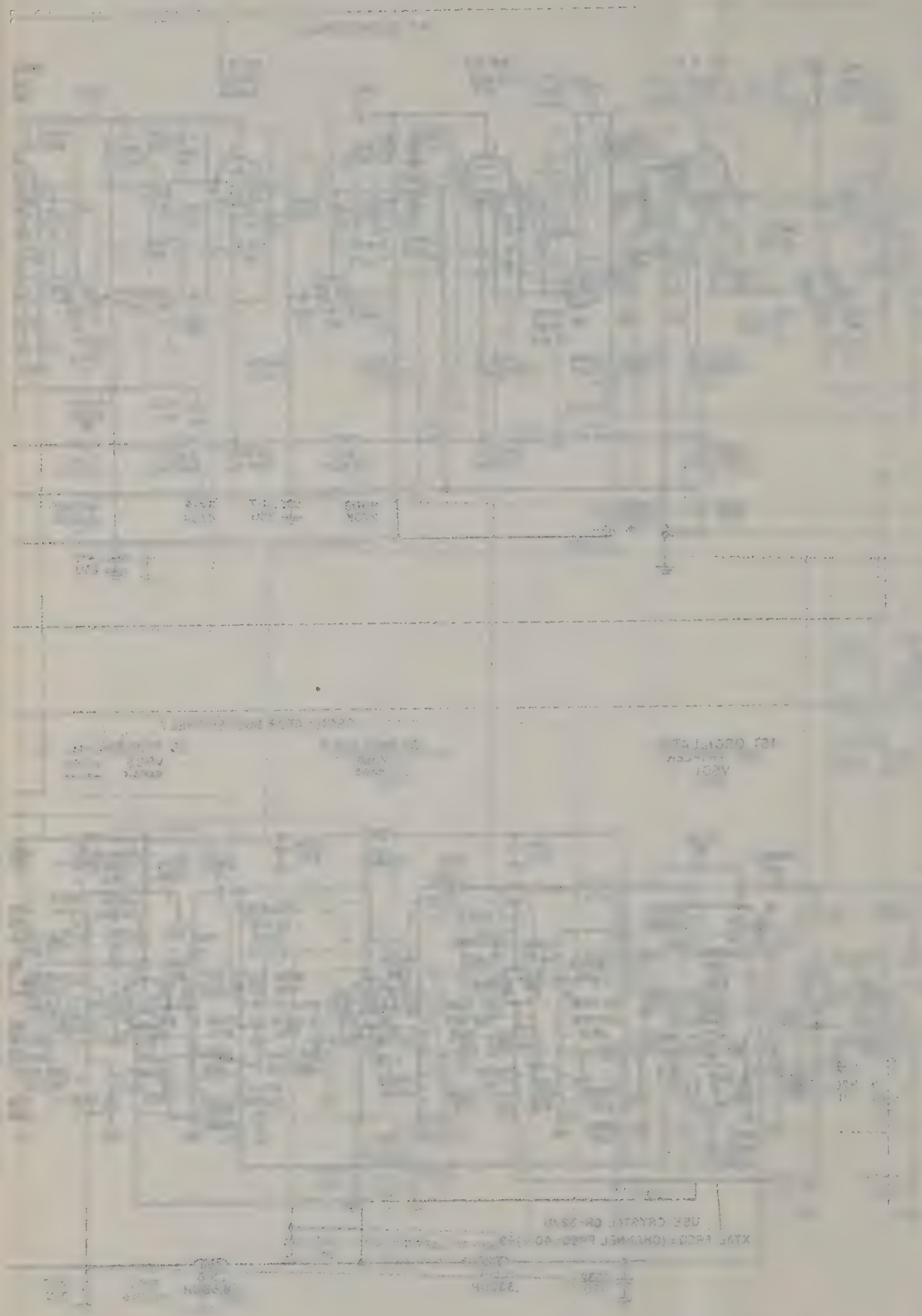
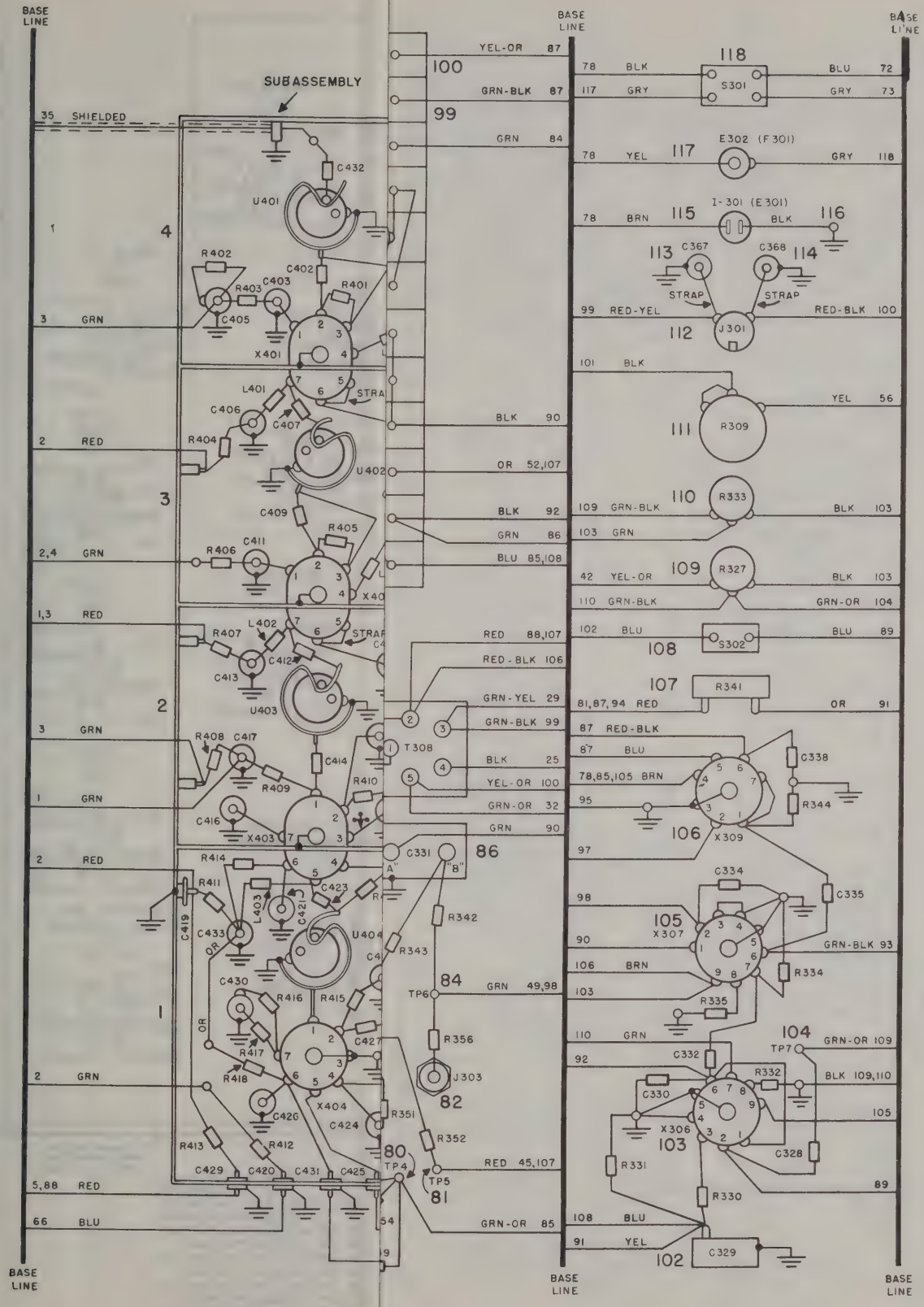
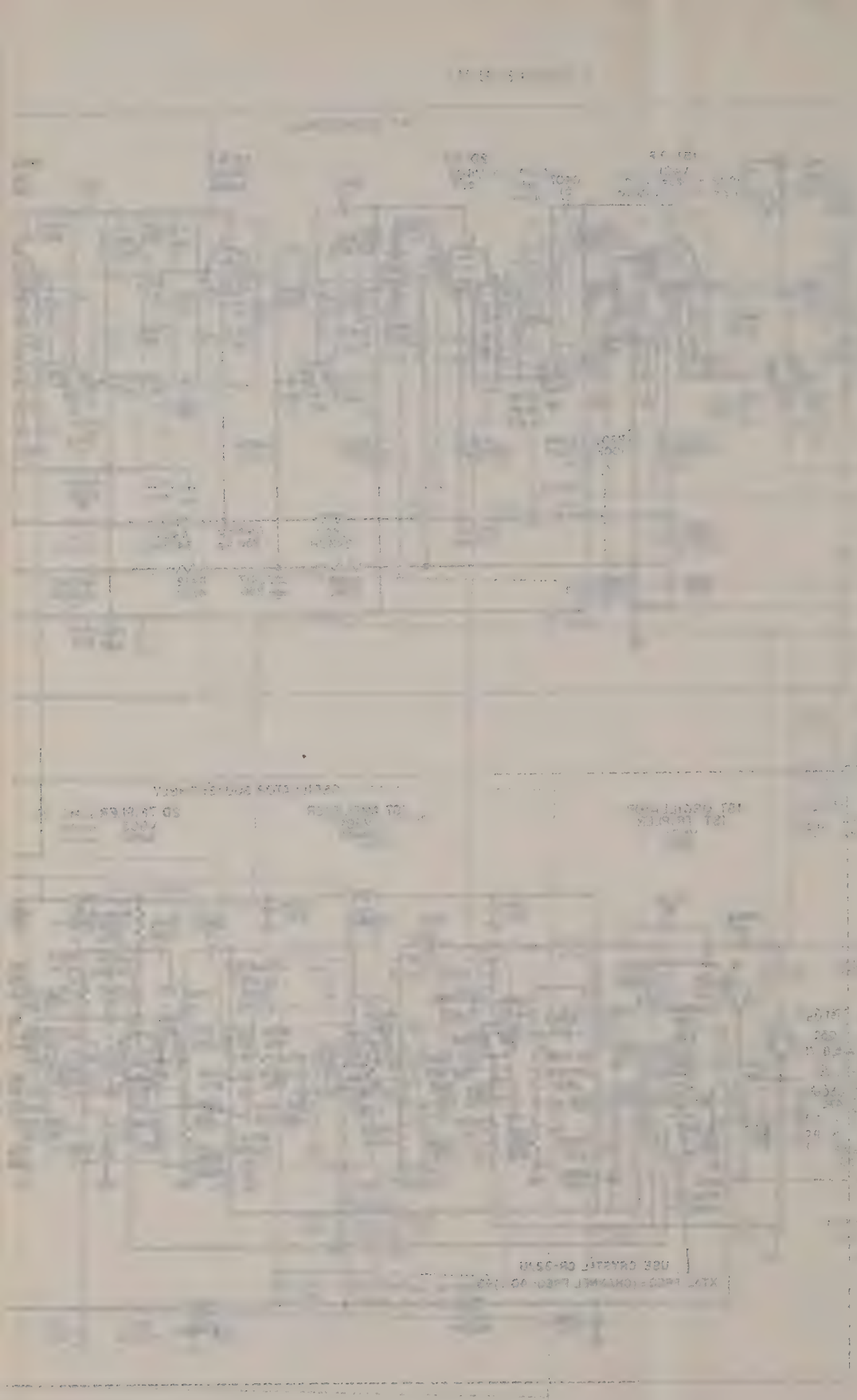

RF SUBASSEMBLY
OSCILLATOR SUBASSEMBLY
IST RF V401 6J4
2D RF V402 6J4
3D RF V403 6AK5W
IST MIXER V404 6AK5W
2D MIXER V301 6BE6
IST I F V302 6BA6 6.0 MC
2D I F V303 6BA6 6.0 MC
3D I F V304 6BA6 6.0 MC
2D DETECTOR NOISE LIMITER V305 6AL5W
IST OSCILLATOR IST TRIPLER V501 12AT7
IST AMPLIFIER V502 6AG5
2D TRIPLER V503 6AK5W
2D AMPLIFIER V504 6AK5W
2D OSCILLATOR V505 12AT7
V306 12AX7
POWER OUTPUT V309 6A05
SQUELCH DIODE V308A
AVC AMPLIFIER V310 6AU6
SQUELCH AMPLIFIER V307A
RECTIFIER V311 5Y3GT
RECTIFIER V312 5Y3GT
IN SETS WITH SERIAL NUMBERS, 1 TO 799 ONLY, MAY CONSIST OF ONE OR TWO 5 CAPACITORS DEPENDING ON THE PARTICULAR I F CIRCUIT PERFORMANCE.
IN SETS WITH SERIAL NUMBERS, 1 TO 799 ONLY.
USE CRYSTAL CR-32/U
XTAL FREQ = (CHANNEL FREQ - 40.4) ÷ 9
USE CRYSTAL CR-23/U
XTAL F = 34.4 MC
AVC
+200V
NOTES:
1- FOR PARTS DESCRIPTION SEE PARTS CATALOG, T.O. NO. 16-35R361-4.
2- UNLESS OTHERWISE NOTED: ALL CAPACITORS ARE IN UUF. ALL RESISTORS ARE IN OHMS. (K = 1,000 OHMS, 1 MEG = 1,000,000 OHMS). ALL RESISTORS ARE ½ WATT.
3- ON RECEIVERS WITH SERIAL NUMBERS 1 TO 799 TRANSFORMERS T304, T305, AND T306 ARE CONSTRUCTED AS SHOWN IN FIGURE 7-13. FOR RECEIVERS WITH SERIAL NUMBERS STARTING WITH 800, SEE FIGURE 7-14.
4-(A) FOR 115V OPERATION REMOVE JUMPER ON T307 BETWEEN TERMINALS 2 AND 3. CONNECT JUMPERS BETWEEN 1 AND 2, 3 AND 4.
(B) FOR 230V OPERATION REMOVE JUMPERS ON T307 BETWEEN TERMINALS 1 AND 2, 3 AND 4. CONNECT JUMPER BETWEEN 2 AND 3.

Figure 7-1. Radio Receiver R-361/GR, Schematic Diagram





2. Radio Receiver R-361/GR, Practical Wiring Diagram



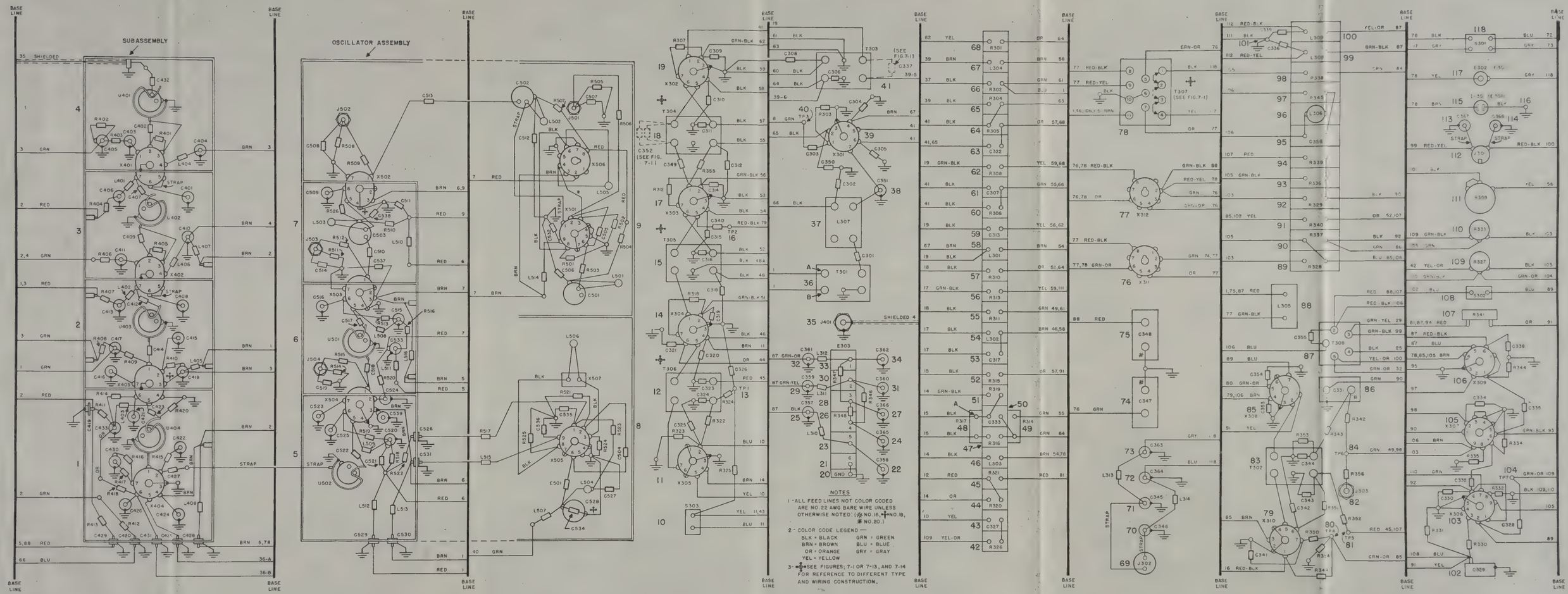
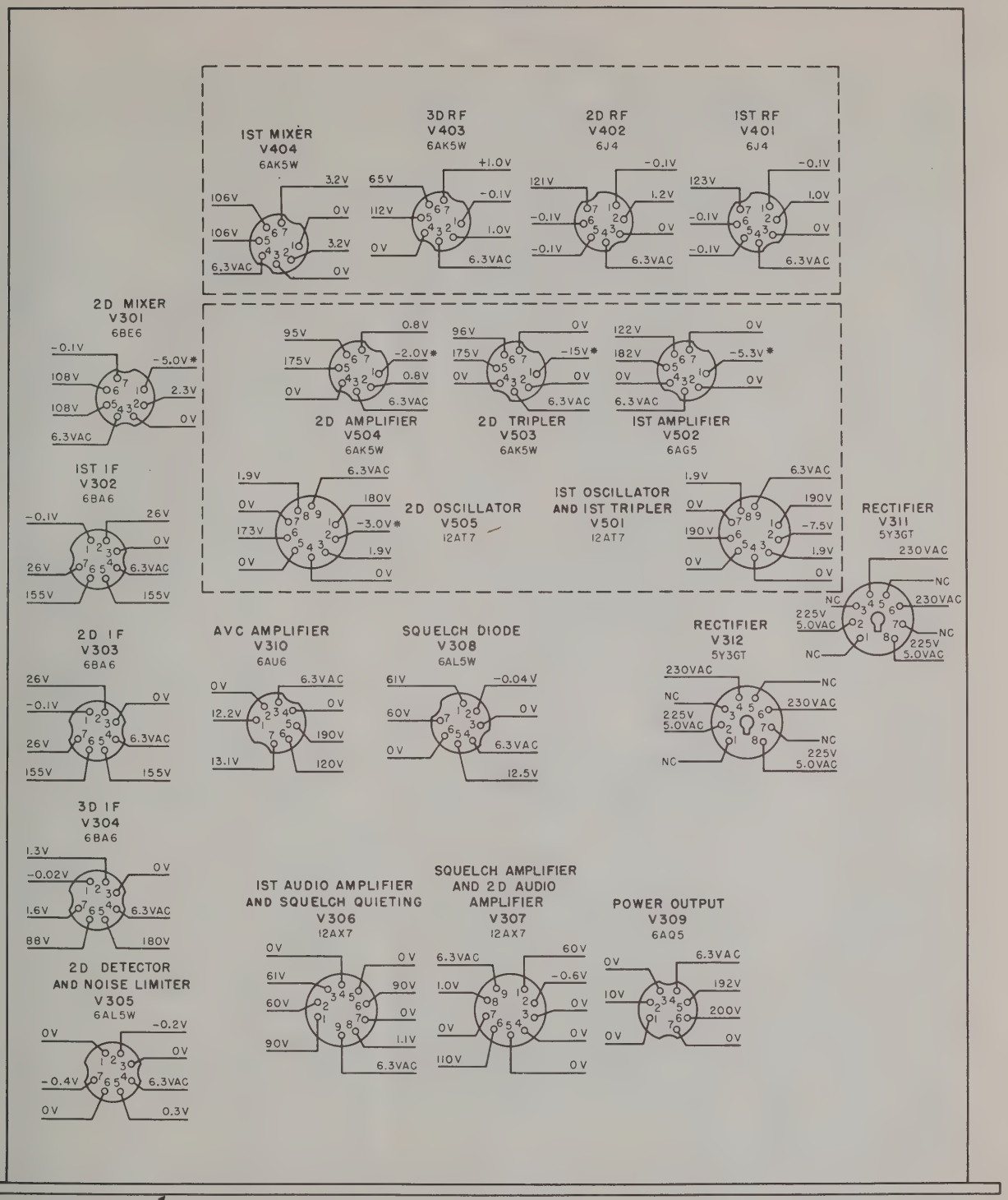

SUBASSEMBLY
OSCILLATOR ASSEMBLY
BASE LINE
NOTES
1 - ALL FEED LINES NOT COLOR CODED ARE NO.22 AWG BARE WIRE UNLESS OTHERWISE NOTED: ⊗ NO.16, ✣ NO.18, ✱ NO.20.)
2 - COLOR CODE LEGEND —
BLK = BLACK
BRN = BROWN
OR = ORANGE
YEL = YELLOW
GRN = GREEN
BLU = BLUE
GRY = GRAY
3 - ✣ SEE FIGURES 7-1 OR 7-13, AND 7-14 FOR REFERENCE TO DIFFERENT TYPE AND WIRING CONSTRUCTION.

Figure 7-2. Radio Receiver R-361/GR, Practical Wiring Diagram


1ST MIXER V404 6AK5W
3.2V 106V 0V 106V 3.2V 6.3VAC 0V
3D RF V403 6AK5W
+1.0V 65V -0.1V 112V 1.0V 0V 6.3VAC
2D RF V402 6J4
-0.1V 121V 1.2V -0.1V 0V -0.1V 6.3VAC
1ST RF V401 6J4
-0.1V 123V 1.0V -0.1V 0V -0.1V 6.3VAC
2D MIXER V301 6BE6
-0.1V -5.0V* 108V 2.3V 108V 0V 6.3VAC
0.8V 95V -2.0V* 175V 0.8V 0V 6.3VAC
2D AMPLIFIER V504 6AK5W
0V 96V -15V* 175V 0V 0V 6.3VAC
2D TRIPLER V503 6AK5W
0V 122V -5.3V* 182V 0V 0V 6.3VAC
1ST AMPLIFIER V502 6AG5
1ST IF V302 6BA6
-0.1V 26V 0V 26V 6.3VAC 155V 155V
1.9V 6.3VAC 0V 180V -3.0V* 173V 1.9V 0V 0V
2D OSCILLATOR V505 12AT7
1.9V 6.3VAC 0V 190V -7.5V* 190V 1.9V 0V 0V
1ST OSCILLATOR AND 1ST TRIPLER V501 12AT7
RECTIFIER V311 5Y3GT
230VAC NC NC 230VAC 225V 5.0VAC NC NC 225V 5.0VAC
2D IF V303 6BA6
26V -0.1V 0V 26V 6.3VAC 155V 155V
AVC AMPLIFIER V310 6AU6
0V 6.3VAC 12.2V 0V 190V 13.1V 120V
SQUELCH DIODE V308 6AL5W
61V -0.04V 60V 0V 6.3VAC 0V 12.5V
RECTIFIER V312 5Y3GT
230VAC NC NC 230VAC 225V 5.0VAC NC NC 225V 5.0VAC
3D IF V304 6BA6
1.3V -0.02V 0V 1.6V 6.3VAC 88V 180V
2D DETECTOR AND NOISE LIMITER V305 6AL5W
0V -0.2V 0V -0.4V 6.3VAC 0V 0.3V
IST AUDIO AMPLIFIER AND SQUELCH QUIETING V306 12AX7
0V 0V 61V 90V 60V 0V 1.1V 90V 6.3VAC
SQUELCH AMPLIFIER AND 2D AUDIO AMPLIFIER V307 12AX7
6.3VAC 60V 1.0V -0.6V 0V 0V 0V 110V 0V
POWER OUTPUT V309 6AQ5
0V 6.3VAC 10V 192V 200V 0V 0V
FRONT PANEL
BOTTOM VIEW

NOTES:

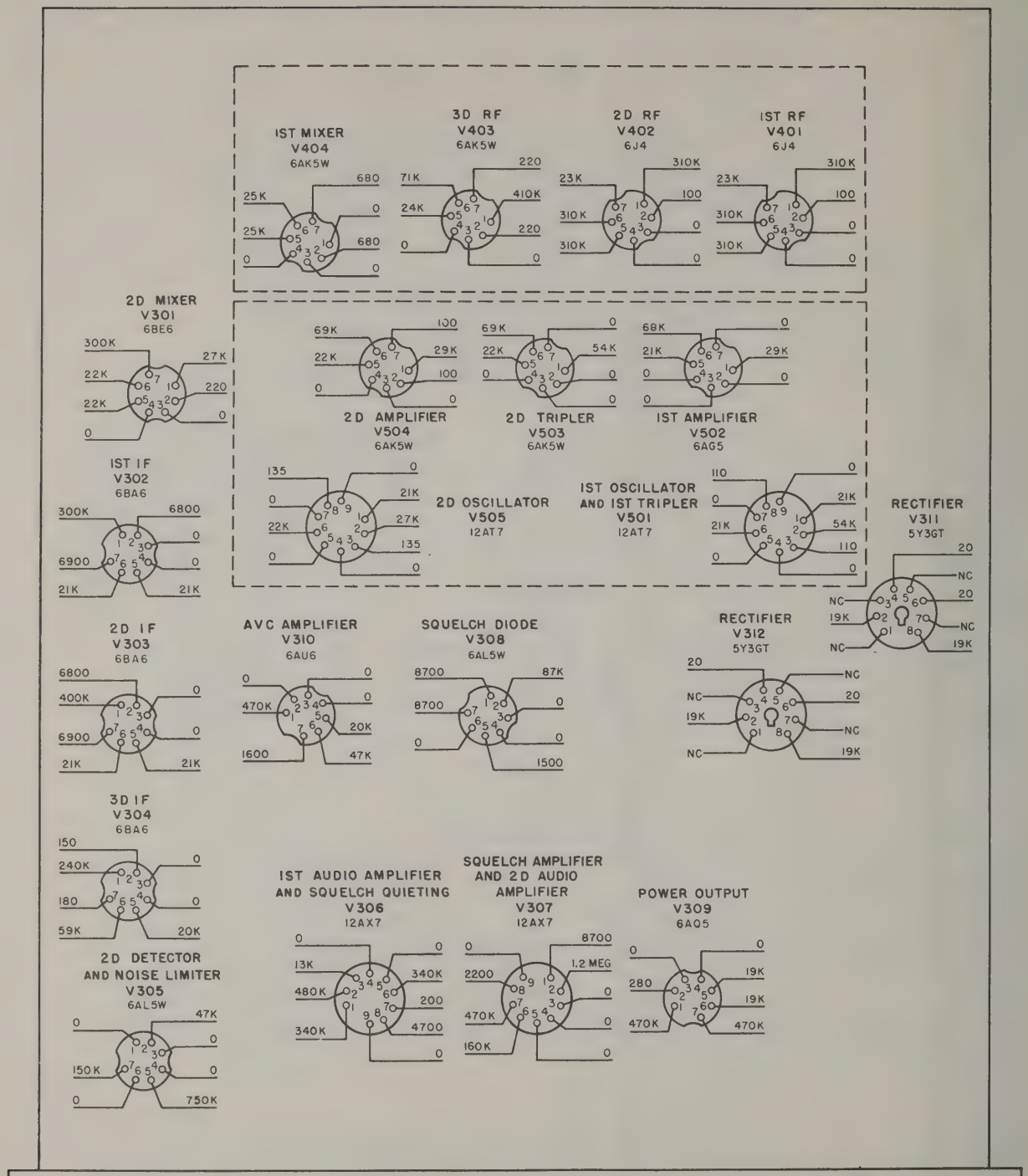
1 ALL VOLTAGE MEASUREMENTS ARE MADE UNDER THE FOLLOWING CONDITIONS:
- (A) THE VOLTAGE SUPPLY AT 115V AT 60 CPS.
- (B) NO RF SIGNAL INPUT.
- (C) THE "AUDIO QUIETING DB" CONTROL IN THE EXTREME COUNTERCLOCKWISE POSITION.
- (D) THE "R.F. GAIN" CONTROL IN THE EXTREME COUNTERCLOCKWISE POSITION.
- (E) THE "A.F. GAIN" CONTROL IN THE EXTREME COUNTERCLOCKWISE POSITION.
- (F) THE NOISE LIMITER SWITCH IN THE "ON" POSITION.
- (G) THE "SQUELCH" SWITCH IN THE "OFF" POSITION.
- (H) ALL VOLTAGES MEASURED WITH A VACUUM TUBE VOLTMETER.
- (J) ALL VOLTAGES DC EXCEPT WHERE NOTED.

2 ALL VOLTAGES MEASURED WITH RESPECT TO GROUND, EXCEPT THE FILAMENTS ON V311 AND V312.

3 NC INDICATES NO CONNECTION.

4 * INDICATES APPROXIMATE VOLTAGE. ACTUAL VOLTAGE DEPENDENT ON CRYSTAL ACTIVITY, MUTUAL CONDUCTANCE OF V501, V502, V503, V505, AND CHANNEL (FREQUENCY) IN USE.

Figure 7-3. Radio Receiver R-361/GR, Tube Socket Voltage Diagram



1-ALL RESISTANCE MEASUREMENTS ARE MADE UNDER THE FOLLOWING CONDITIONS:
(A) THE "AUDIO QUIETING DB", "R.F. GAIN" AND "A.F. GAIN" CONTROLS IN THE EXTREME COUNTERCLOCKWISE POSITION.
(B) THE NOISE LIMITER SWITCH IN THE "ON" POSITION.
(C) THE "SQUELCH" SWITCH IN THE "OFF" POSITION.

2-ALL RESISTANCE VALUES ARE IN OHMS (K=1,000 OHMS, 1MEG=1,000,000 OHMS).

3-ALL RESISTANCE READINGS ARE TO GROUND.

4-NC INDICATES NO CONNECTION.

Figure 7-4. Radio Receiver R-361/GR, Tube Socket Resistance Diagram

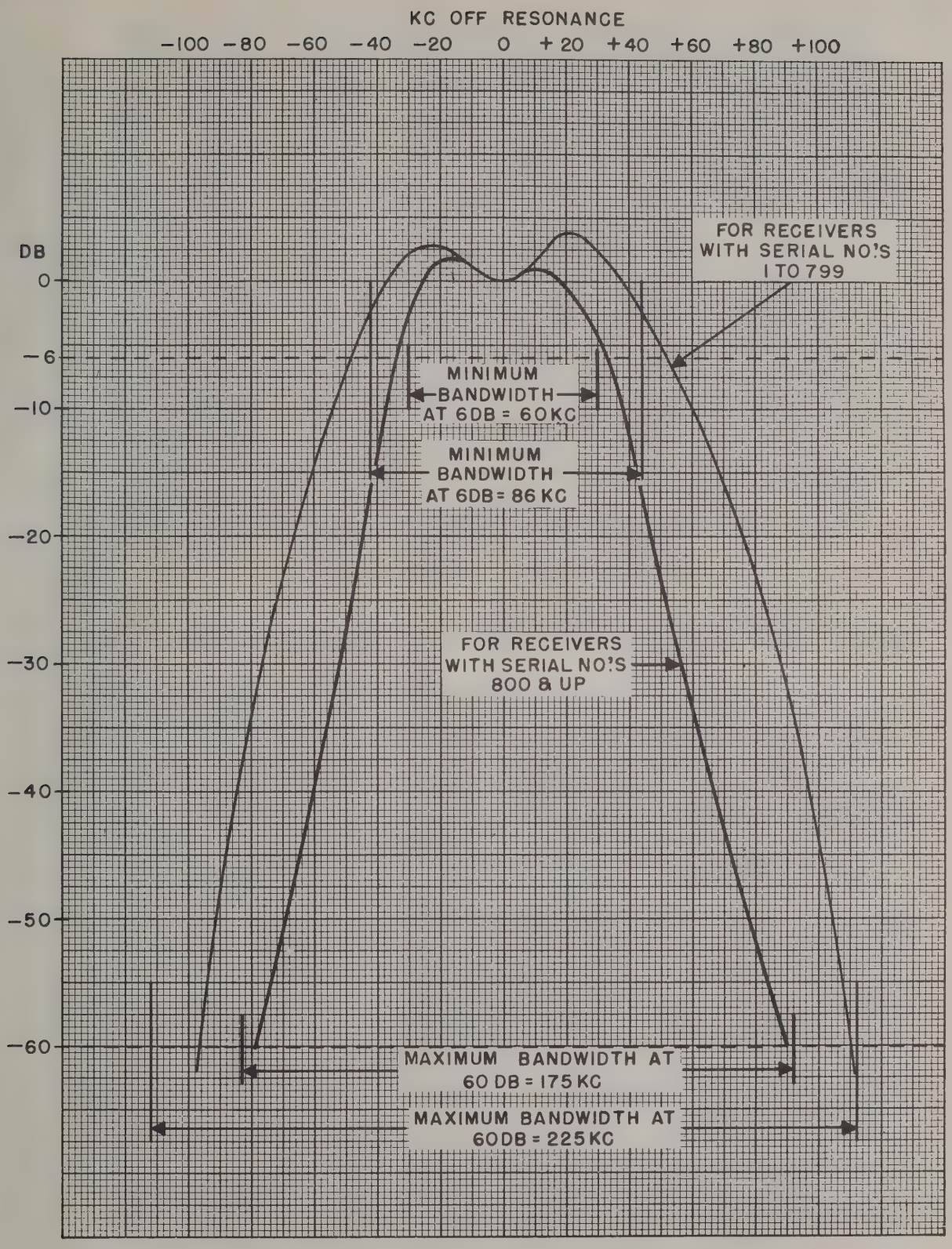


Figure 7-5. Radio Receiver 361/GR, I-F Bandwidth Curves

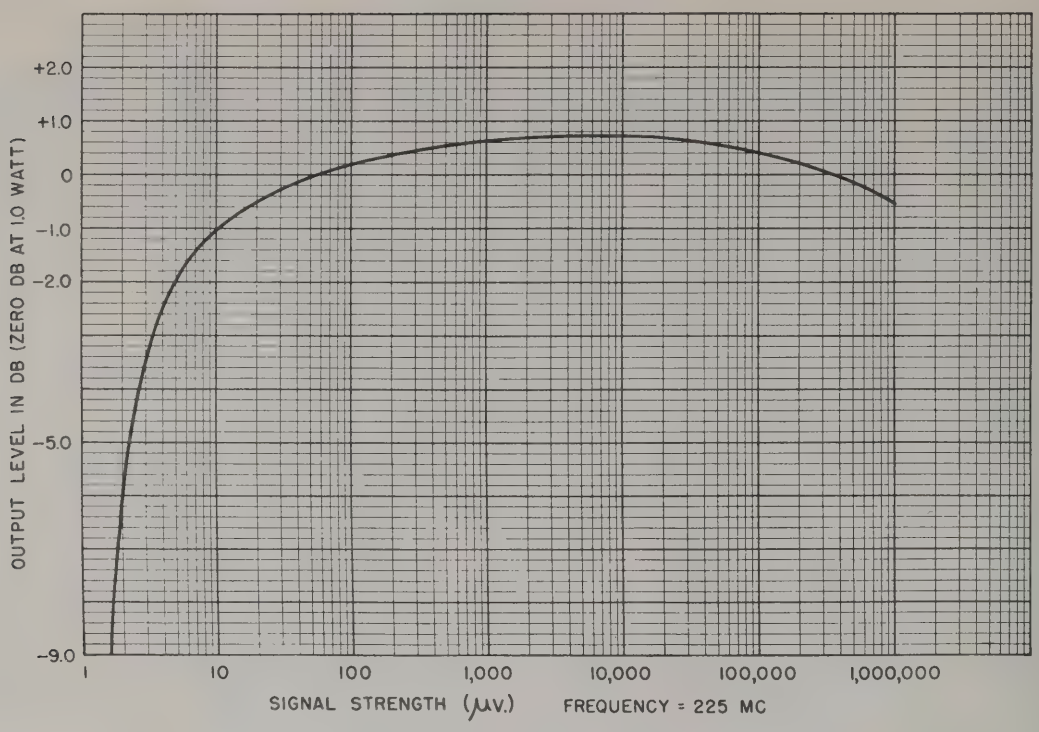


Figure 7-6. Radio Receiver R-361/GR, Automatic Volume Control Characteristics at 225 MC

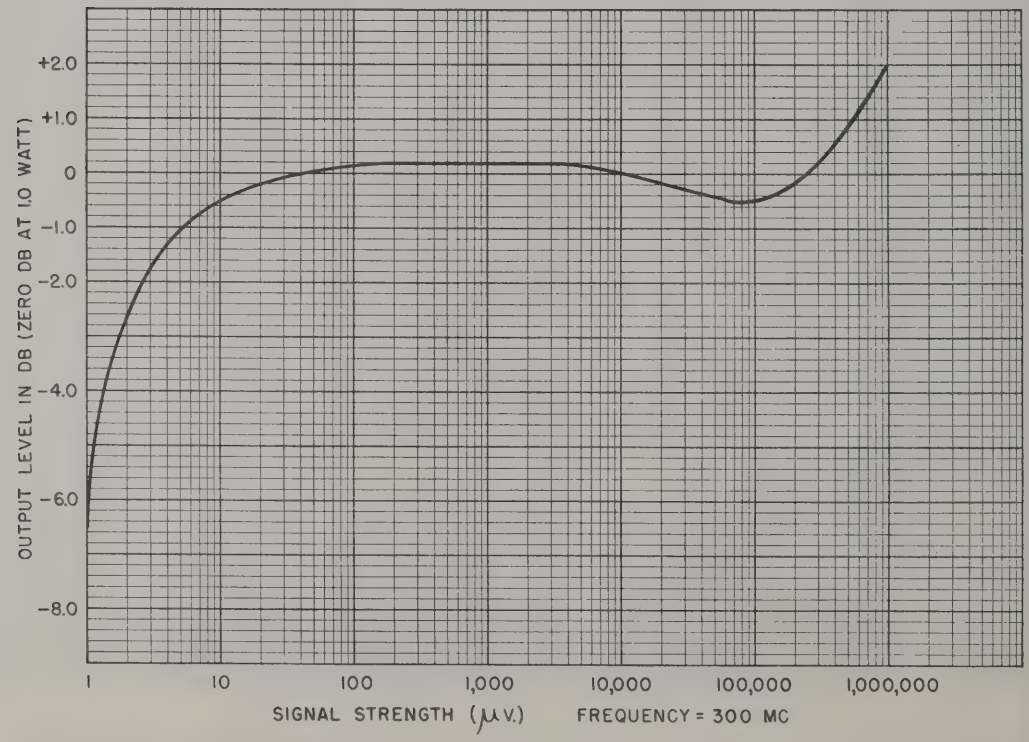


Figure 7-7. Radio Receiver R-361/GR, Automatic Volume Control Characteristics at 300 MC

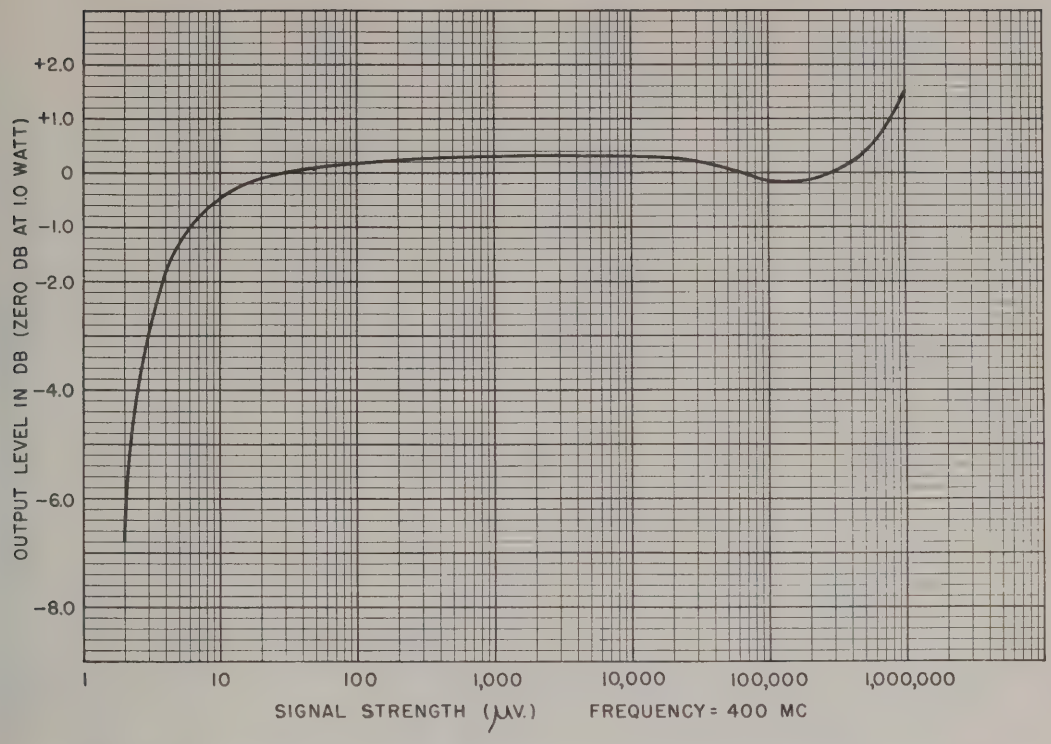


Figure 7-8. Radio Receiver R-361/GR, Automatic Volume Control Characteristics at 399 MC

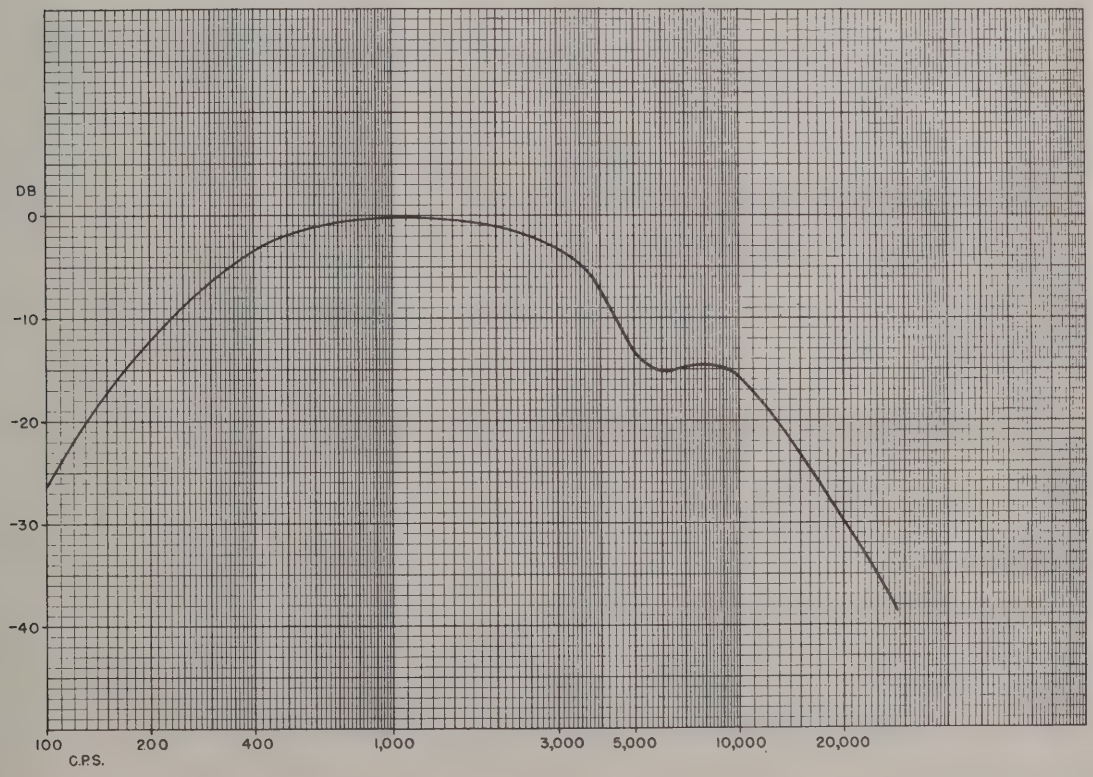


Figure 7-9. Radio Receiver R-361/GR, Audio Frequency Response Curve

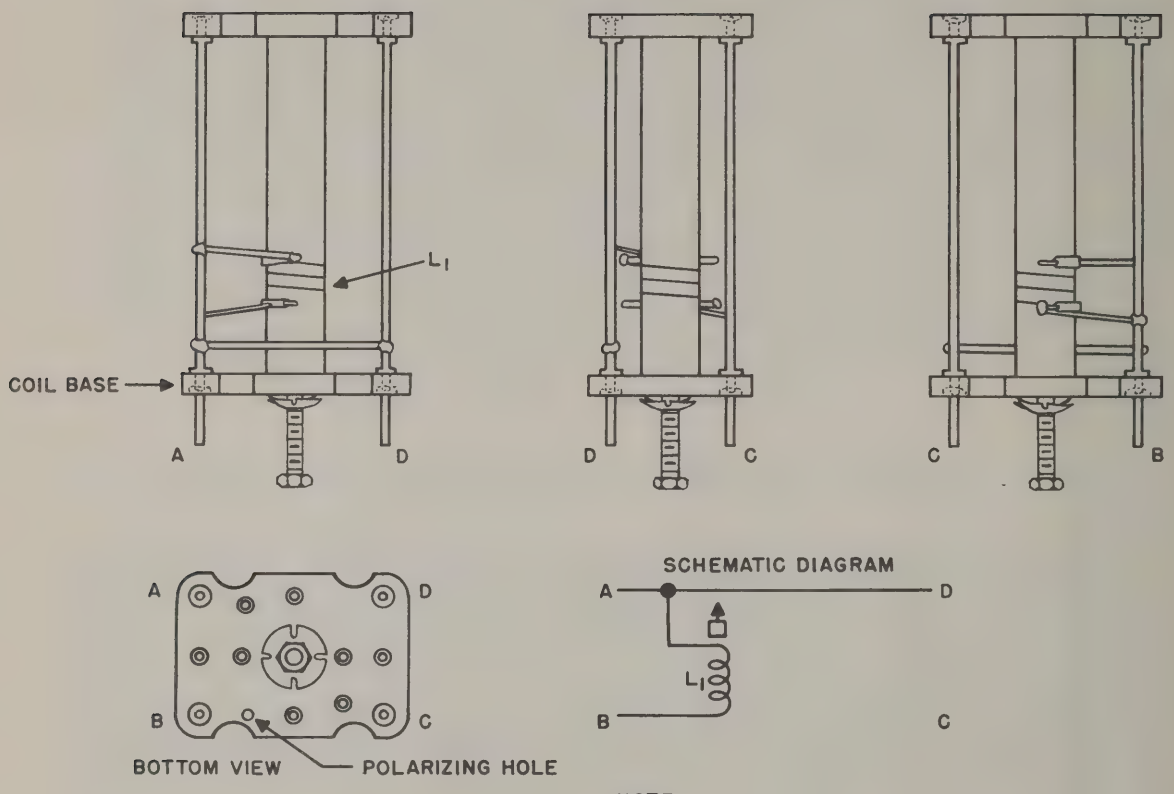
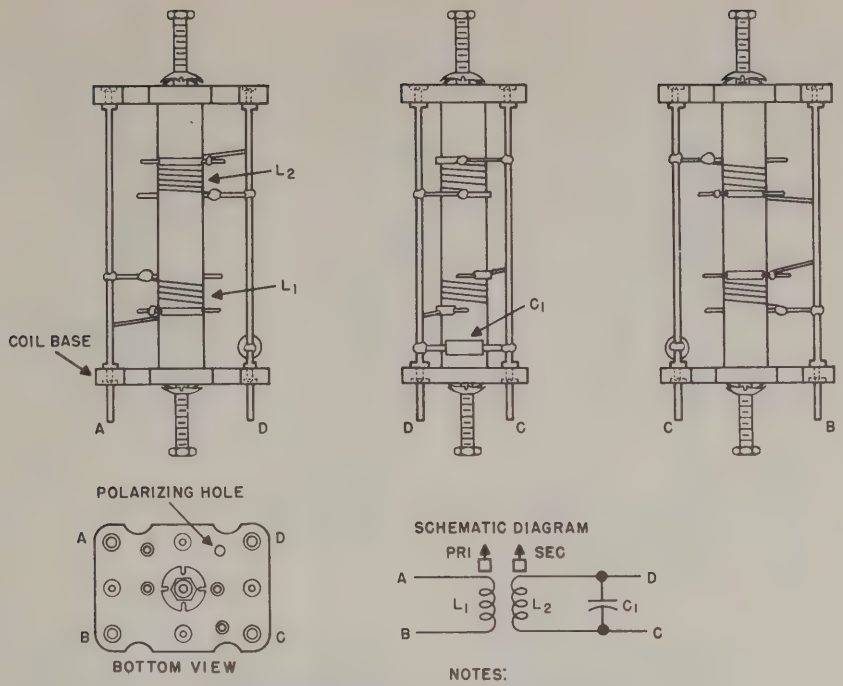


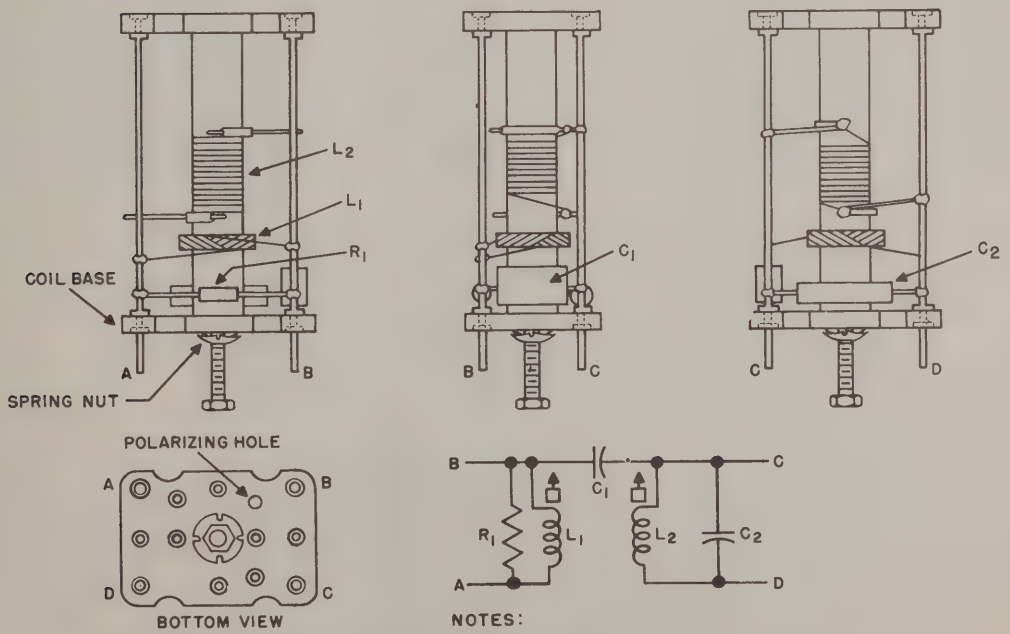
Figure 7-10. Radio Receiver R-361/GR, Construction of L307



NOTES:

1- C_1-24 UUF CAPACITOR, JAN TYPE CC26CH240J.
2- L_1-5 TURNS NO. 22(0.025) AWG TINNED COPPER WIRE.
3- L_2-5 TURNS NO. 22(0.025) AWG TINNED COPPER WIRE.

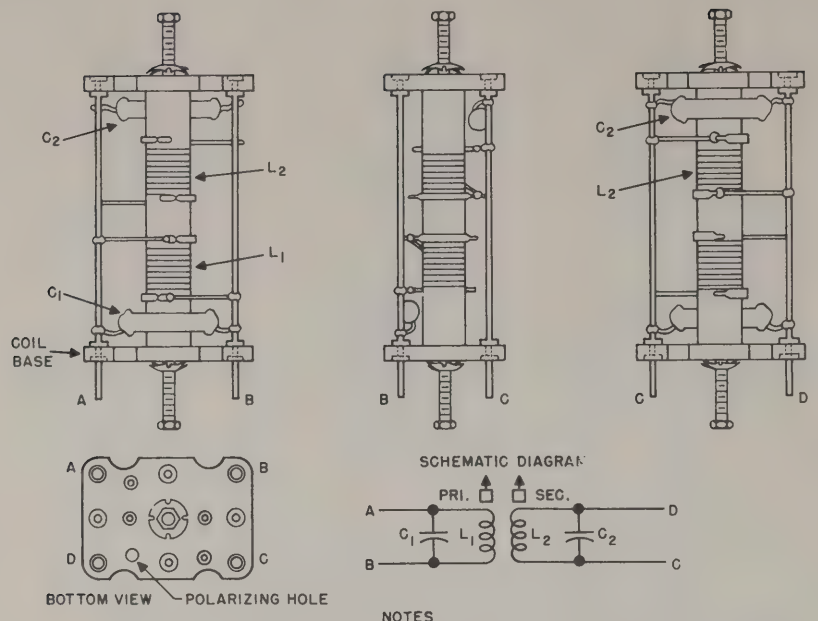
Figure 7-11. Radio Receiver R-361/GR, Construction of T301



NOTES:

1- C_1-240 UUF CAPACITOR, JAN TYPE CM20C241J.
2- C_2-51 UUF CAPACITOR, JAN TYPE CC36HG510J.
3- L_1-175 TURNS NO.34AWG, SINGLE SILK ENAMEL COPPER WIRE.
4- L_2-30 TURNS NO.26AWG, FORMVAR ENAMEL COPPER WIRE
5- R_1-33K OHMS RESISTOR, JAN TYPE RC20BF333K.

Figure 7-12. Radio Receiver R-361/GR, Construction of T302

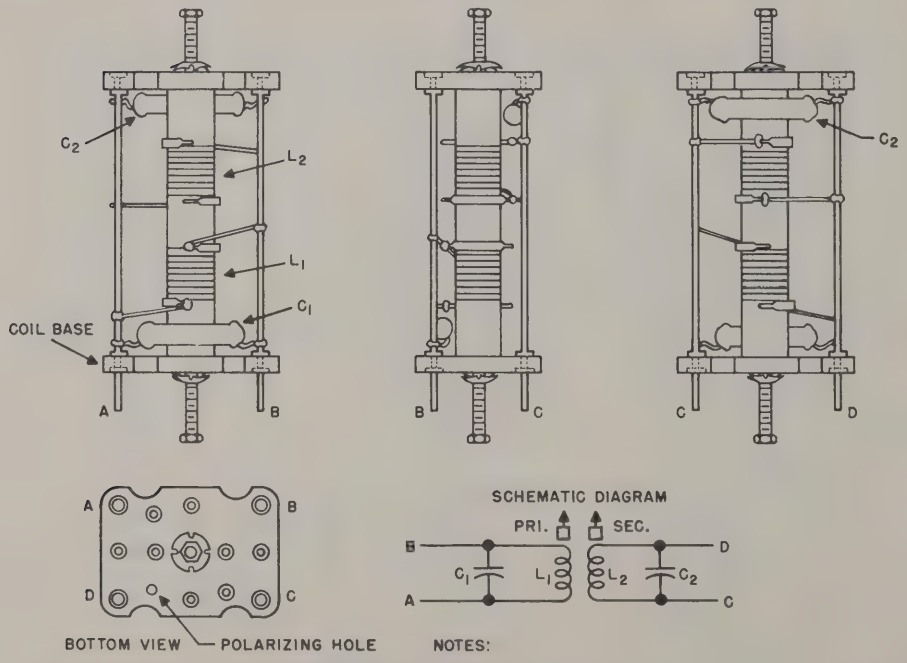


NOTES

1- ON RECEIVERS WITH SERIAL NUMBERS 1 TO 799 INCLUSIVE, THIS ASSEMBLY APPLIES ALSO TO, T304, T305, T306. FOR RECEIVERS WITH SERIAL NUMBERS STARTING WITH 800, SEE FIGURE 7-14.

2- C_1-150UUF CAPACITOR, JAN TYPE CC35HG151J.
3- C_2-150 UUF CAPACITOR, JAN TYPE CC35HG151J.
4- L_1-20 TURNS NO.26AWG TINNED COPPER WIRE.
5- L_2-20 TURNS NO.26AWG TINNED COPPER WIRE.

Figure 7-13. Radio Receiver R-361/GR, Construction of T303

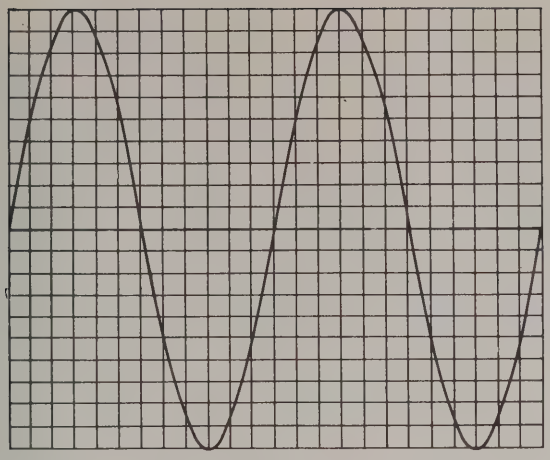


NOTES:

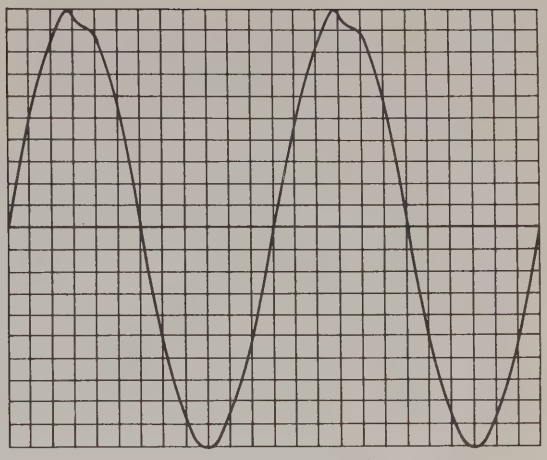
1- THIS ASSEMBLY APPLIES TO RECEIVERS WITH SERIAL NUMBERS 800 AND UP. FOR RECEIVERS WITH SERIAL NUMBERS BELOW 800, SEE FIGURE 7-13.

2- C_1-150 UUF CAPACITOR, JAN TYPE CC35HG151J.
3- C_2-150 UUF CAPACITOR, JAN TYPE CC35HG151J.
4- L_1-20 TURNS NO.26AWG TINNED COPPER WIRE.
5- L_2-20 TURNS NO.26AWG TINNED COPPER WIRE.

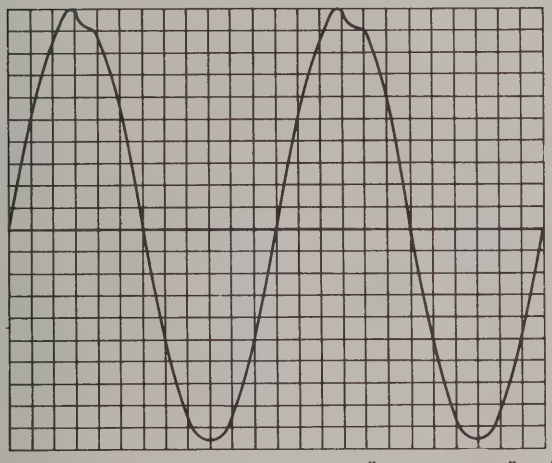
Figure 7-14. Radio Receiver R-361/GR, Construction of T304, T305 and T306



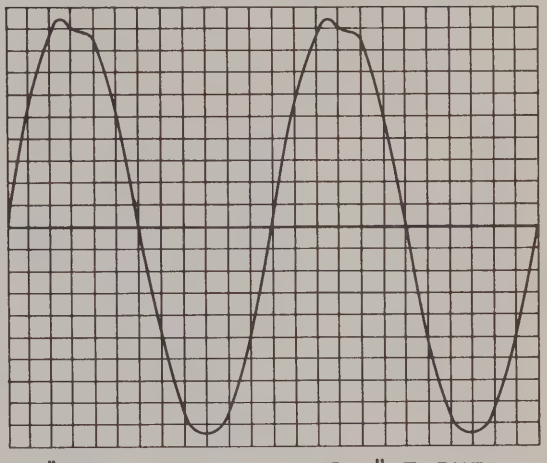
1- "NOISE LIMITER SWITCH" TURNED "OFF," LESS THAN 90 PERCENT MODULATION



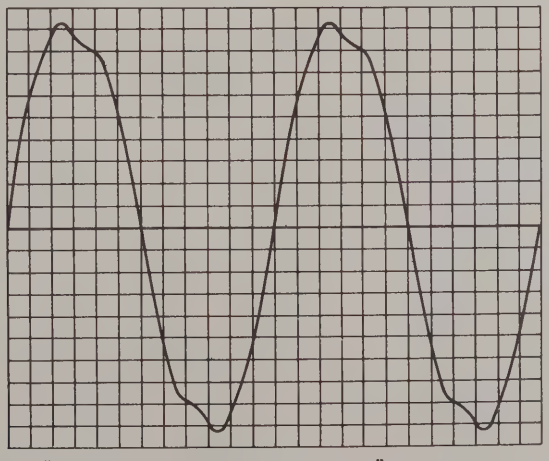
2- "NOISE LIMITER SWITCH" TURNED "OFF," 90 PERCENT MODULATION



3- "NOISE LIMITER SWITCH" TURNED "ON," 90 PERCENT MODULATION

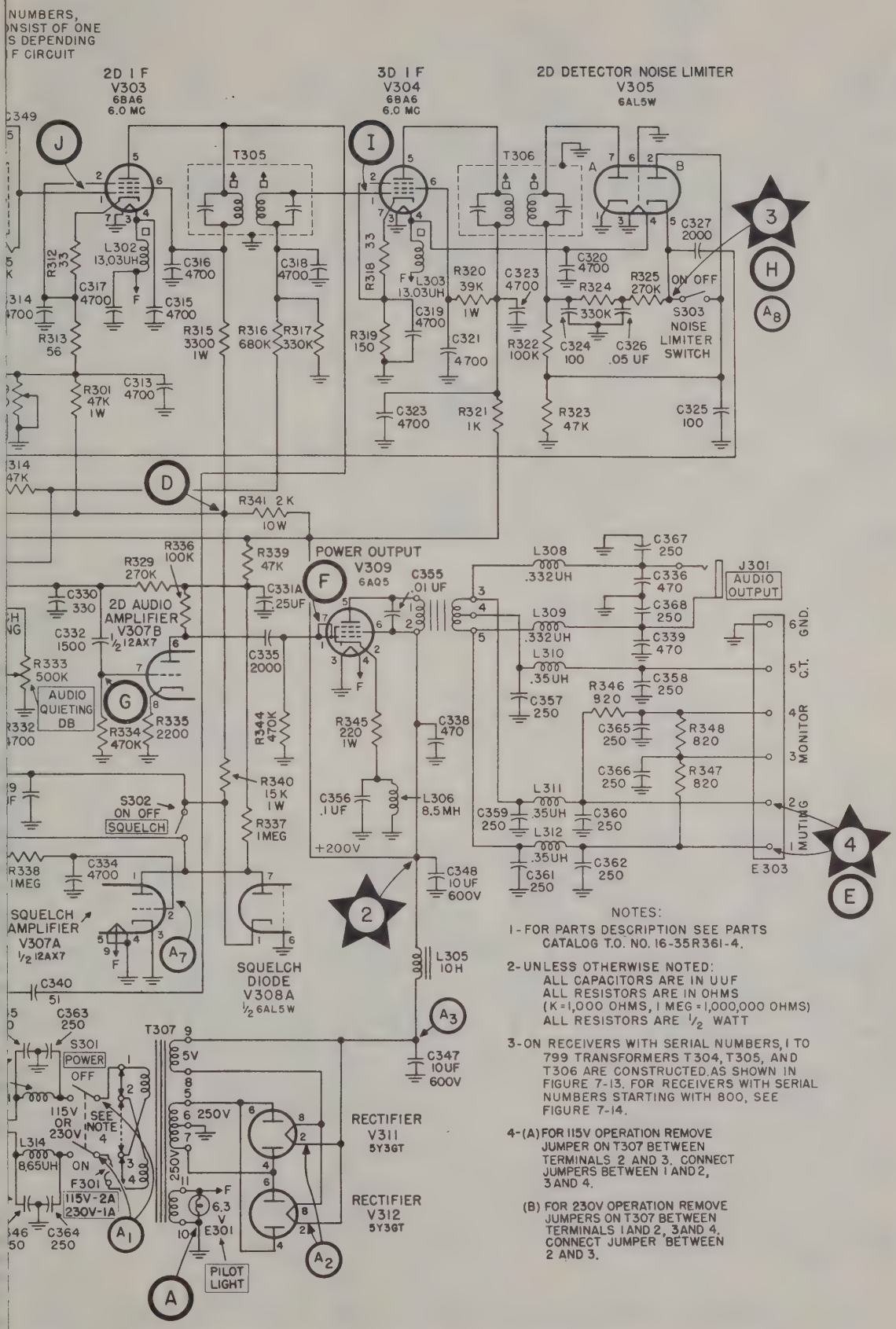


4- "NOISE LIMITER SWITCH" TURNED "OFF," 100 PERCENT MODULATION



5- "NOISE LIMITER SWITCH" TURNED "ON," 100 PERCENT MODULATION

Figure 7-15. Radio Receiver R-361/GR, Instantaneous Waveforms for the Second Detector and Noise Limiter



NOTES:

1 - FOR PARTS DESCRIPTION SEE PARTS CATALOG T.O. NO. 16-35R361-4.

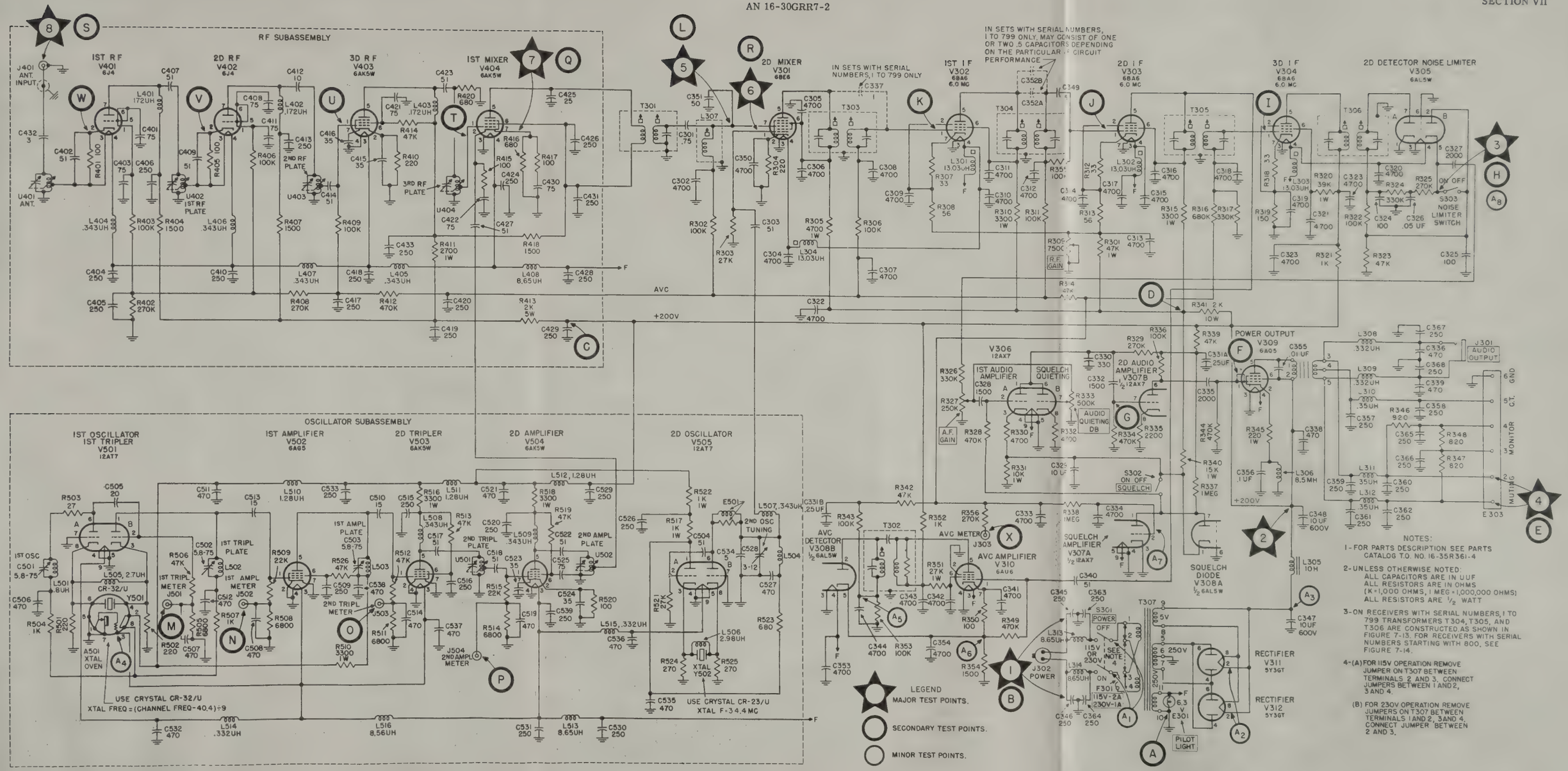
2 - UNLESS OTHERWISE NOTED:
ALL CAPACITORS ARE IN UUF
ALL RESISTORS ARE IN OHMS
(K = 1,000 OHMS, 1 MEG = 1,000,000 OHMS)
ALL RESISTORS ARE ½ WATT

3 - ON RECEIVERS WITH SERIAL NUMBERS, 1 TO 799 TRANSFORMERS T304, T305, AND T306 ARE CONSTRUCTED AS SHOWN IN FIGURE 7-13. FOR RECEIVERS WITH SERIAL NUMBERS STARTING WITH 800, SEE FIGURE 7-14.

4 - (A) FOR 115V OPERATION REMOVE JUMPER ON T307 BETWEEN TERMINALS 2 AND 3. CONNECT JUMPERS BETWEEN 1 AND 2, 3 AND 4.

(B) FOR 230V OPERATION REMOVE JUMPERS ON T307 BETWEEN TERMINALS 1 AND 2, 3 AND 4. CONNECT JUMPER BETWEEN 2 AND 3.

Figure 7-16. Radio Receiver R-361/GR, Test Point Identification Symbols on Schematic Diagram



NOTES:

1- FOR PARTS DESCRIPTION SEE PARTS CATALOG T.O. NO. 16-35R361-4

2- UNLESS OTHERWISE NOTED: ALL CAPACITORS ARE IN UUF ALL RESISTORS ARE IN OHMS (K=1,000 OHMS, 1 MEG=1,000,000 OHMS) ALL RESISTORS ARE ½ WATT

3- ON RECEIVERS WITH SERIAL NUMBERS, 1 TO 799 TRANSFORMERS T304, T305, AND T306 ARE CONSTRUCTED AS SHOWN IN FIGURE 7-13. FOR RECEIVERS WITH SERIAL NUMBERS STARTING WITH 800, SEE FIGURE 7-14.

4-(A) FOR 115V OPERATION REMOVE JUMPER ON T307 BETWEEN TERMINALS 2 AND 3. CONNECT JUMPERS BETWEEN 1 AND 2, 3 AND 4.

(B) FOR 230V OPERATION REMOVE JUMPERS ON T307 BETWEEN TERMINALS 1 AND 2, 3 AND 4. CONNECT JUMPER BETWEEN 2 AND 3.

Figure 7-16. Radio Receiver R-361/GR, Test Point Identification Symbols on Schematic Diagram

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